MARINE NEMATODES FROM BANYULS-SUR-MER: WITH A REVIEW OF THE GENUS *EURYSTOMINA*

By WILLIAM G. INGLIS

CONTENTS

SYNOPSIS

Twelve species of free-living marine nematodes from Banyuls-sur-Mer, France, are described, of which seven are considered to be new, thus: *Enoplus quadridentatus* Berlin, 1853; *Phanoderma parafilipjevi* Allgén, 1939; *Oncholaimus dujardinii* de Man, 1876; *Prooncholaimus banyulensis* sp. nov. ; *Symplocostoma tenuicolle* (Eberth, 1863) ; *Eurystomina pettiti* sp. nov. ; *Chromadorina demani* sp. nov. ; *Euchromadora gaulica* sp. nov. ; *Euchromadora tyrrenica* Brunetti, 1952 ; *Hypodontolaimus colesi* sp. nov. ; *Paracanthonchus barka* sp. nov. and *Sphaerocephalum chabaudi* sp. nov. The genus *Eurystomina* Filipjev, 1921, is reviewed and four previously-recorded species are considered to be distinct species which are named as new, thus : *E. chilensis* = *E. retrocellatum* of Wieser, 1953*a* ; *E. chitwoodi* = *E. americana* of Chitwood, 1951 ; *E. gerlachi* = *E. assimile* of Gerlach, 1951 ; *E. wieseri* = *E. stenolaima* of Wieser, 1953*a*. A new genus, *Gerlachystomina*, is introduced for *Eurystomina filispiculum* Gerlach, 1954 (type species) and *E. sawayai* Gerlach, 1954*a*. The genus is characterized by simple pre-cloacal supplements and a simple gubernaculum without an apophysis in the male ; and by short cephalic setae and no bulbs in the posterior end of the oesophagus in both sexes. A summary of other changes in *Eurystomina* is given on p. 256. *Chromadorina laeta* of Micoletzky, 1924, is considered to be a distinct species and the name *C. micoletzkyi* is proposed for it. The cuticular capsules which are present at the anterior end of the oesophagus and the anterior end of the body in some Enoploids are discussed. The presence of a dorso-lateral pore-like sense (?) organ on the head of at least some species of *Euchromadora* and on one species of *Hypodontolaimus* is reported and the name *amphidule* is proposed for it. The possible significance of this organ is briefly discussed. It is argued that the structure of the cuticle in *Euchromadora* is probably to be explained on a functional basis, elaborations being restricted to the lateral parts of the body since the degree of expansion and contraction to which it is exposed must be less there than in a more dorsal or ventral position. Support is expressed for De Coninck's theory of the primitive arrangement of the sense organs on the nematode head but the argument is advanced that the presence of six lips, considered primitive by both De Coninck and Chitwood & Wehr, is not primitive. It is suggested that more probably an arrangement similar to that found in the family Chromadoridae, for example, is primitive. That is, a mouth opening which is roughly circular, without lips. The male of *Sphaerocephalum chabaudi* is described and as this is the first time a male of this genus has been found the genus is re-diagnosed. The nomenclatorial changes proposed in this report are listed on p. 278.

INTRODUCTION

THE study of the free-living marine Nematoda has tended to be characterized by the enthusiastic naming of " new " species rather than by the thoroughness of the descriptions. As a result the systematics of the group are chaotic since it is probably fair to estimate that at least a third of the published records are unreliable.

The thorough study of free-living nematodes is so difficult when the specimens are in a good condition, or preferably alive, that to attempt to study poorly-preserved material is a waste of time and, further, the general lack of knowledge of the morphology of almost all groups renders it extremely difficult, if not impossible, to identify species on the basis of females or larvae alone. Wieser (1955) and Chitwood (1960) both make this point and Wieser goes so far as to state " One certainly could not be proved wrong if one refused to accept the determination of marine nematodes from lesser-known regions ... if they are not based on both males and females and accompanied by figures, or at least by absolute measurements and a succinct description." He later adds " I do not advocate the suppression of all determinations based on females and juveniles ... but I am convinced that ... much more precise and painstaking methods of detecting and describing differential characters in nematodes have to be employed than has been (and still is) the case." With all this I am in complete agreement but I am prepared to go much further—I will not, in general, accept identifications based solely on females or larvae and I will insist on treating almost all species based originally on females or larvae alone as *species dubiae*. The treatment of such species and records as valueless cannot upset the study of the distribution of the free-living marine nematodes since, outside European waters (with some laudable exceptions), the study of such nematodes is not even in its infancy but is embryonic and unless some such radical step as I propose is taken now the position in the future can only become worse.

Much of the difficulty facing anyone wishing to study free-living marine nematodes must be attributed to the superficial way in which some authors have described a multiplicity of nominal species. In particular I would mention Allgén's publication (1959) " Free-living marine nematodes ". *Further Zoological Results of the Swedish Antarctic Expedition* 1901–03. Vol. V, No. 2, pp. 1–293, which is clearly based on a study of badly-preserved specimens with the result that all the descriptions are very poor. They are not only inadequate, they are not consistent. The figures, for example, in many cases do not agree with the descriptions and, where more than one figure is given of the same species, the figures do not correspond. I, therefore, propose to treat every species named or reported in this publication as a *species dubia*.

Wieser (1953*a*) claims in the introduction to his paper that he will present evidence confirming the "... untenability of the view that marine nematodes are cosmopolitan as a whole—" but later (1955) says that the latter (1955) report "... certainly supports the idea of the general cosmopolitan occurrence of marine nematodes ...". However, in the case of at least one of the species reported by him—*Eurystomina ornata*—it is clear that his species is not conspecific with the European form (see p. 249) and it is also probable that another of his reported species, *Oncholaimus dujardinii*, is not the European species but *O. steineri* (see p. 228). Further, of the remaining eight " Species with a more or less cosmopolitan distribution " one identification is based on a single juvenile and another on one female. In fact, as Wieser points out, one-third of the species recorded in his paper have been identified on the basis of females and (or) juveniles. Wieser's descriptions are, on the whole, good but I cannot accept that he has here established anything about the cosmopolitan distribution of nematodes. It is possible only to repeat what is said above, and what has been said before (Chitwood, 1951 ; Inglis, 1961) that attempts at the present time to reach any conclusions on the geographical distribution of free-living marine nematodes are foredoomed to failure because of insufficient information.

REMARKS ON THE MORPHOLOGY OF MARINE NEMATODES

The Structure of the Head in the Enoploids[1]

Wieser (1954*a*) considers the structure of the head in the family Leptosomatidae and demonstrates that there are two cuticular capsules present at the anterior end of the body. One capsule is produced by a thickening of the inner layers of the cuticular covering of the body, the *cephalic capsule*, and the other by a thickening

---

[1] While agreeing with Chitwood (1960) that the higher classification of the Nematoda is so unsatisfactory that many of the groups recognized are of little significance it is, nevertheless, essential to have some names covering large groups even although their exact limits cannot be satisfactorily established. In this sense the Enoploids correspond to the Enoploidea as treated by Wieser (1953).

of the outer covering of the oesophagus, the *stomodaeal capsule*. The foremost part of the stomodaeal capsule is called by Wieser the *stomodaeal ring* and it is at this ring that the main attachment of the stomodaeal and cephalic capsules takes place. Wieser further suggests that the stomodaeal ring is derived from the stomodaeal capsule and that, apparently, the ring is not fused to the cephalic capsule around its entire circumference but only opposite the three sectors of the oesophagus.

I accept this interpretation of the structure of the head, at least in part. Two capsules tend to be present not only in the Leptosomatidae but also in the Enoplidae, the Phanodermatidae and the Ironidae and this is the condition referred to by Chitwood (in Chitwood & Chitwood, 1950) as " Cuticle of head duplicate ; . . ." but it does not apply to the genera of the families Oncholaimidae, Enchelidiidae and Dorylaimidae. Functionally the two capsules appear to be associated with the presence of jaws and/or teeth and it may be noted that the degree of development of the capsules is associated with the degree of development of such tooth-like structures. In both the forms I have studied in detail, *Enoplus quadridentatus* (see p. 219) and *Phanoderma parafilipjevi* (see p. 224), the oesophagus and body wall appear to be joined over a much greater area than the stomodaeal ring, and this also appears to be true of several species of *Thoracostoma* which I have studied for purposes of comparison. In *Enoplus* the fusion occurs over three sectors of the outer surface of the oesophagus which correspond to the three sectors of the tri-radiate oesophagus. That is, the fusion is opposite the three jaws of the head, the three places at which increased strengthening is required for simple mechanical reasons. In *Phanoderma* and *Thoracostoma*—on the other hand the fusion appears to be much more extensive and appears to take place around the entire circumference of the oesophagus for some distance posterior to the anterior limit of that organ. This appears to be associated with the presence of anteriorly directed tooth-like structures in these genera. However, even in *Enoplus* the cephalic capsule is completely fused to the oesophagus at the anterior end, although a stomodaeal capsule does not appear to be present. This zone of complete attachment appears to correspond to the stomodaeal ring of Wieser.

In *Enoplus* the attachment of the oesophagus to the body wall is complete around the stomodaeal ring except for the presence of six foramina through which pass the nerves which supply the inner circle of cephalic papillae (see Text-fig. 1). These foramina are bounded internally by the covering of the oesophagus and externally by the cephalic capsule. The presence of such foramina, associated with the attachment of the oesophagus to the body wall represents a clear convergence with the condition found in *Sphaerolaimus anterides* (see Inglis, 1961) in which the cuticular wall of the buccal cavity is attached to the body wall by a series of buttresses and the nerves which supply the anterior sense organs of the head pass through the foramina between the buttresses. In the case of *Sphaerolaimus* the fusion of the buccal capsule and the body wall appears to have occurred to overcome the weaknesses inherent in developing a very large buccal cavity, while in the genus *Enoplus* it appears to be associated with the necessity for supplying some reinforcement to a head equipped with three large jaws. The fusion cannot be complete since some provision must be made for the passage of the nerves to the anterior sense organs of the head. This is done by the foramina in some cases but also explains the form of the cephalic capsule in genera such as *Thoracostoma* in which the cephalic capsule is divided posteriorly into six lobes (see almost any good figure of the head of this genus, e.g. de Man, 1904 ; Wieser, 1956*a* ; Mawson, 1956 and 1958 ; Inglis, 1958*a*). In all cases the posterior incisions (terminology of Wieser, 1954) correspond to the arrangement of the cephalic sense organs and provide a passage for the nerves which go to them. A similar condition appears to apply to some genera of the Enoplidae in which the cephalic capsule is more extensive than it is in *Enoplus*.

It should be noted that, although the degree of development of the two capsules may be of value in delimiting groups of nematodes, or in establishing trends and relationships, since these structures appear to be functionally associated with the complexity of the tooth- or jaw-like structures, the head must be treated as a functional unit. Thus the additional information obtained by an analysis of the capsules may simply parallel that available in the form and arrangement of the cephalic tooth- and jaw-like structures.

The Theoretical Importance of the Chromadoroids

The same difficulty is encountered here as in the discussion of the Enoploids, that of defining the group under discussion. The Chromadoroids in the sense intended here include the families Chromadoridae, Cyatholaimidae and some, at least, of the Desmodoridae as given by Wieser (1954*b*), since this appears to constitute a relatively homogeneous group although, as with the Enoploids, it is difficult to determine the limits in a wholly satisfactory manner.

The Head in Euchromadora *and* Hypodontolaimus

The head in all, or at least most of, the genera referred to the three families mentioned above is characterized by the presence of twelve rugae, that is—twelve cuticular rod-like structures which support a cuticular sheath around a circular, poorly delimited mouth opening (see Filipjev, 1918–21 ; Chitwood in Chitwood & Chitwood, 1950 ; De Coninck, 1942 ; Steiner & Hoeppli, 1926 ; Inglis, 1961 and 1961*a*). The head in the genera *Euchromadora* and *Hypodontolaimus* is characterized by this form of mouth opening and carries a pair of what appear to be sense organs which are additional to the usual slit-like lateral amphids. These pore-like structures are dorso-lateral in position (see Text-figs. 41 and 59) and appear to have been figured on only one other occasion, by Steiner & Hoeppli (1926, fig. M, 1) who do not refer to them in their description of *Euchromadora archaica* although they do figure the usual amphids. I have also seen such dorso-lateral structures in *Euchromadora vulgaris* where the slit-like lateral amphids are also present. The importance of these structures is not clear since their occurrence in other genera is unknown (possibly the structures I called the amphids (Inglis, 1961) in *Hypodontolaimus angolae* may, in fact, be similar structures) but it is interesting to contrast them with the cephalic slits which occur in so many of the Enoploids (e.g. *Enoplus*, *Trissonchulus* and many others. See Filipjev, 1927). To draw attention to this organ I propose for it the name AMPHIDULE.

Cuticular Structures in the Genus Euchromadora

The complicated basket-work arrangement of fibres in the cuticle of many species of the genus *Euchromadora* is well known but reports of the presence of what I later describe as *lateral-plates* (see p. 261) are rare. These structures, which are probably of value in delimiting species within this genus (I am studying this at present in conjunction with Mr. John W. Coles), are, like most of the other elaborations of the nematode cuticle, restricted to the lateral surfaces of the body. Modifications to the cuticle on the lateral surface of the body are common throughout the Nematoda but in the Chromadoroids are internal rather than external. That is, they take the form of structures buried within the cuticle and do not produce bumps or ridges on the outer surface. Wieser (1953*a*) says " The cuticular ornamentation of marine nematodes plays an important role in the act of motion of the worms ", by which I take him to mean, also taking into consideration what he says later, that the cuticular markings help to grip the substrate. This may apply in some cases but certainly cannot apply to the Chromadoroids. Steiner & Hoeppli (1926) give what appears to me to be the best discussion of the significance of the rod-like structures in cuticle of the *Euchromadora*-type, they act as structural elements which strengthen the cuticle and, also, perhaps confer a certain amount of additional protection. Steiner & Hoeppli conclude their discussion of *E. archaica* with two questions " Why is this arrangement (of rods in the cuticle)? Is it because all these regions with lamelles or rods need to be stiffened, need strength and yet more elasticity?" The answer, I would suggest, is simply that such structures can only occur on the lateral parts of the body without reducing the flexibility of the body. Thus, the body only bends in the dorso-ventral plane so that the zone of least extension or compression of the cuticle must be on the lateral sides of the body, the extent of the extension or compression increasing the more dorsal or ventral the zone considered. If any special form of strengthening is required this must, if it is to be effective, have a low elasticity (conversely increased rigidity) and such structures can only be introduced into parts of the body in which this lack of elasticity will be of relatively little importance. This zone being the lateral parts of the body. In connection with this it should be noted that the lateral rod-like structures in the cuticle become shorter and less massive towards the dorsal and ventral limits of the lateral fields. The lateral plates conform to this in that they are broadest where fully lateral and become narrower towards their dorsal and ventral extremities. The reversal of the direction of the lateral plates is also explained—at least in part—by the Steiner-Hoeppli analysis in which they demonstrate a similar reversal of the annulations of the body in *Dicriconema tenuis* and argue that " the vulvar region forms the base of mobility for the anterior as well as for the posterior body part ". This must certainly play some part but is clearly not the full explanation for this remarkable reversal since Cobb (1917) reports that a similar reversal occurs in a wide range of species and genera (without specifying any of them).

The Primitive Nematode Head

In discussing the form of the nematode head only two theories appear to be worthy of serious consideration, those of Chitwood & Wehr (1934) (further elaborated by Chitwood (in Chitwood & Chitwood, 1950) and of De Coninck (1942)). Both of these theories accept that the primitive nematode was equipped with a six-lipped mouth opening and disagree largely on the distribution of the cephalic sense organs, with the result that the Chitwood theory argues that the primitive number and arrangement of the cephalic sense organs was an inner circle of six and an outer circle of twelve while De Coninck argues for an inner circle of six, an intermediate circle of six and an outer circle of four. Of these two theories I prefer that of De Coninck which corresponds much more closely to the conditions found in most free-living nematodes and in many parasitic forms. The Chitwood theory not only necessitates the postulation of an additional, hypothetical, papilla but simply does not accord with the facts in many cases. Thus his argument on the segregation of the papillae of the so-called external circle (pp. 56 and 57 of Chitwood & Chitwood, 1950) in the Ascaridoidea, at least, is simply not true as can be easily seen by studying the figures reproduced by Hartwich (1951). Chitwood & Wehr (1934) appear to be attempting to superimpose a secondary symmetry on the head in that they have six lips with three papillae, arranged in a triangular fashion, on each.

However, I disagree with both theories on one major point. I cannot accept that the presence of six lips is a primitive character. It appears to me to be much more probable that the primitive mouth opening is that shown by the Chromadoroids. That is, a circular mouth opening surrounded by a series of rugae. Not only does this correspond to the condition found in the Gastrotrichs, the presumptive ancestors of the Nematoda (or at least part of the Nematoda), but also simplifies the consideration of the head forms occurring in many of the groups of both free-living and parasitic nematodes. For Chitwood & Wehr the Rhabditid nematodes are primitive, for De Coninck a Plectid type is primitive while Hyman (1951) argues that the Chromadoroids are primitive. I agree with Hyman. The detailed argument in support of this thesis will be presented elsewhere but it is worth pointing out that the cuticular modifications found in the Chromadoroids suggest an early attempt to overcome the difficulties inherent in an elongate body, an attempt which has imposed certain restrictions on the resulting body form which have been overcome in other groups, along other lines. Thus, as Chitwood & Chitwood (1950) point out, the structure of the cuticle in the Chromadoroids does not appear to possess the oblique fibres found in other groups and I would suggest that the cuticular modifications characteristic of this group are a reflection of this fact. One further point in connection with the Chromadoroid head is of interest, the presence of amphidules in at least two genera (? others. Possibly confused with amphids?). Do the amphidules correspond to the cephalic slits of the Enoploids? If they do, do both sets of sense organs (cephalic slits and amphidules) represent corresponding sense organs in the Gastrotrichs? The final, and much the most important, question is, if the presence of two sets of lateral cephalic organs of this type is widespread in the free-living nematodes are the posteriorly situated amphids of, for example, *Enoplus* homologous with the amphids of such forms as *Ascaris* or are the so-called amphids of the latter genus homologous with the amphidules or cephalic slits of the free-living forms?

TECHNIQUES

The adequate study of free-living nematodes depends on patience, good fixation in conjunction with the study of living specimens and careful preparation of specimens after fixation. All the specimens studied here were heat paralysed, fixed in sea-water " TAF " (see Goodey, 1957) and cleared in glycerine by the slow method. That is, the specimens were placed in dilute glycerine made up as follows: 5 c.c. glycerine in 95 c.c. 30% alcohol and the alcohol was allowed to evaporate slowly in a desiccator. The evaporation taking about six to seven days. The specimens were then studied in pure glycerine under a free cover-slip supported at one side by lens-cleaning tissue. This method has the great advantage that if the specimen moves it is trapped between the cover-slip and the slide by the movement of the glycerine only and is not subject to distortion due to pressure. This method is virtually essential if an adequate study is to be made since it allows the specimen to be rolled and, with practice, it is possible to roll specimens below 1 mm. in total length.

The study of the heads of nematodes in *en face* preparations is most important if the morphology and interrelationships of the various parts of the head are to be fully understood. In addition it is valuable in establishing the distribution of the sense organs of the head. As an example the presence of the amphidule on the head of *Euchromadora* species can only be established by the use of such preparations and, of course, the shape of the mouth opening cannot be established in any other way. The method I employ is a combination of those published by Basir (1949) and Anderson (1958). The specimen is put into a drop of glycerine jelly *on a cover-slip* and is pulled out into a streak of glycerine jelly. The jelly is allowed partly to harden and the head is cut off by means of a piece of razor-blade held in a watchmaker's pin-vice. The head is then orientated so that it *faces* the surface of the cover-slip, the slip is then inverted on a slide and the orientation of the head is checked. As Anderson (1958) points out, this method has the great advantage that the cut surface does not have to be at right angles to the longitudinal axis of the body and the length of the anterior end of the body which is cut off is not crucial. In the case of the small free-living species this is a very great advantage. Anderson recommends that the drop of glycerine jelly be sufficiently large to touch the surface of the slide when the cover-slip is supported on pieces of wire, paper or glass rod but this I have found to be not wholly satisfactory under some conditions, particularly in cases where the piece of worm cut off is long. I find that if the head is orientated under a dissecting microscope at a magnification of about ×100, with practice it is possible to get it virtually vertical and I prefer to mount the head preparation over the cavity of a cavity-slide which I flood with liquid glycerine. However, the use of mounts of this kind, although virtually essential with the very small forms has one very grave disadvantage. It is impossible to incline the head to various angles while studying it. For a full study of the head several specimens are required some of which are studied as above and others of which are studied using the complete method of Anderson with which the angle from which the head is studied can be varied, but if only one specimen is available a full *en face* view should be aimed at and under such conditions I prefer the use of a cavity-slide.

SYSTEMATIC SECTION

All the specimens reported on here were collected during a visit to the Laboratoire "Arago", Banyuls-sur-Mer during September, 1959. They all came from one locality, among low-growing sea-weeds with very little sediment on the rocks near the laboratory lying on the Spanish side of the causeway between the laboratory and the rocky islands which lie just off-shore (Ile Grosse or Mont aux Morts). Only species represented by both males and females are described and the intention of this report is to deal with the structure of these species in detail, particular stress being laid on the structure of the head. The marine nematodes of this area have been reported on by Allgén (1943) and by Gerlach (1954). Allgén's paper covers a wide range of habitats and a large number of species, but, as Schuurmans Stekhoven (1950) says "I do not in all respects agree with Allgén's identification(s)" while Gerlach's report is restricted to a study of a few species from the interstitial water of the beach. A list of all the species reported from the Mediterranean is given by Schuurmans Stekhoven (1950) but the value of such a list must be considered doubtful since it is quite certain that many of the records must be based on mis-identifications.

The following species are described in this report :

Enoplus quadridentatus Berlin, 1853 (p. 219).
Phanoderma parafilipjevi Allgén, 1939 (p. 224).
Oncholaimus dujardinii de Man, 1876 (p. 226).
Prooncholaimus banyulensis sp. nov. (p. 229).
Symplocostoma tenuicolle (Eberth, 1863) (p. 232).
Eurystomina pettiti sp. nov. (p. 234).
Chromadorina demani sp. nov. (p. 257).
Euchromadora gaulica sp. nov. (p. 260).
Euchromadora tyrrenica Brunetti, 1952 (p. 264).
Hypodontolaimus colesi sp. nov. (p. 266).
Paracanthonchus barka sp. nov. (p. 271).
Sphaerocephalum chabaudi sp. nov. (p. 273).

As a result of trying to establish the validity of certain characters in the delimitations of species within the genus *Eurystomina* it has been found necessary to review that genus. This review begins on p. 237.

Enoplus quadridentatus Berlin, 1853

Material Studied

6 ♂, 5♀, 53 larvae. B.M. (N.H.), Reg. Nos. 1961.237–283 and 1961.391–395.

	Ratios				
	a	*b*	*c*	V	Body length
Males . .	24·7	5·1	14·6	—	4·0*
	23·2	4·6	14·6	—	4·3
	35·4	5·4	15·8	—	4·6
	32·0	5·3	15·2	—	4·8
Females . .	25·8	6·7	13·4	56·4	3·1
	24·8	6·7	13·6	52·2	3·4
	29·0	6·4	14·8	53·5	4·3
Larvae . .	31·7	7·8	12·6	—	1·9
	26·3	4·6	15·6	—	4·2
	25·0	5·8	18·0	—	4·5

* This specimen was moulting from the fourth-stage to the adult-stage.

Measurements (*in mm.; in order of body lengths above*)

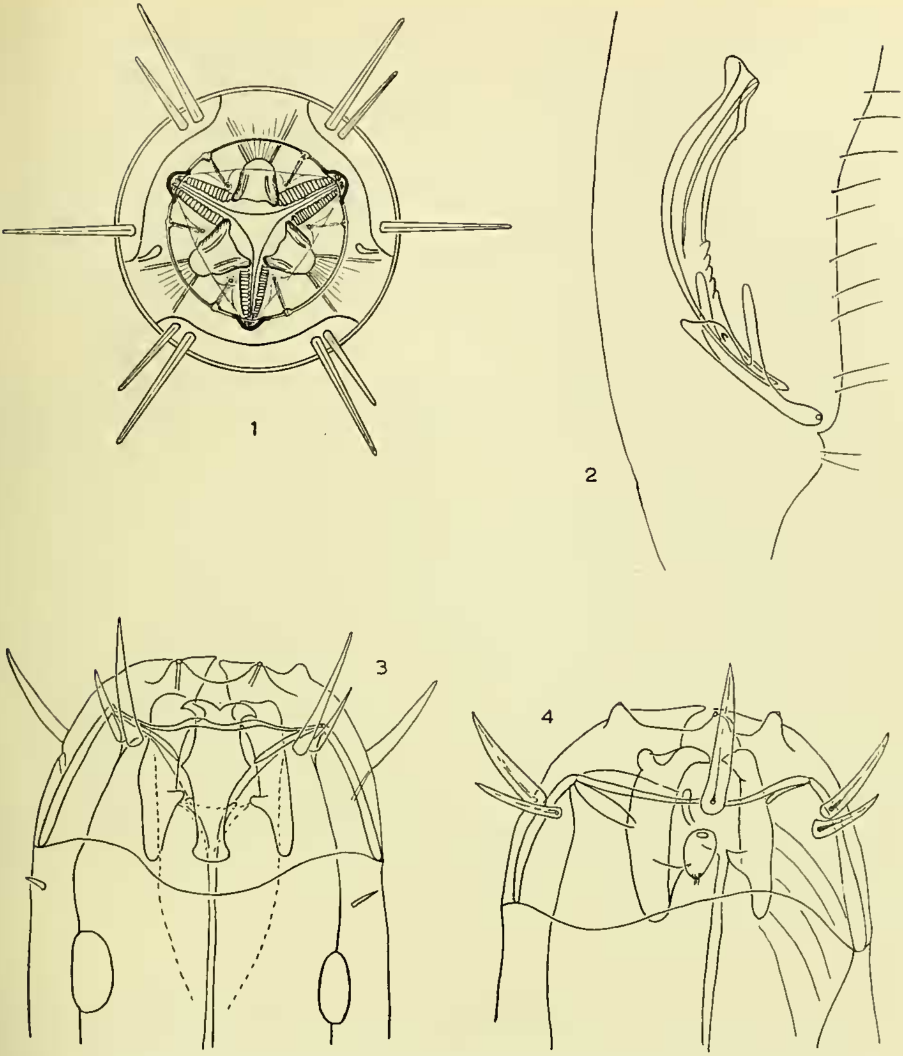
MALES. Body breadth: 0·16; 0·18; 0·13; 0·15. Oesophagus length: 0·78; 0·92; 0·86; 0·91. Diameter of head: 0·039 (larva) and 0·048 (in adult); 0·047; 0·052. Cephalic capsule, posterior diameter/depth: 0·064 (larva) and 0·071 (adult)/0·037 (larva) and 0·043 (adult); 0·079/0·046; 0·076/0·044; 0·078/0·048. Lengths of cephalic setae: ... ; 0·016 and 0·023; 0·016 and 0·029; 0·017 and 0·028. Length of jaws: 0·035 (larva) and 0·042 (adult); 0·037; 0·043; 0·044. Eye spots from the anterior end: ... ; 0·078; 0·081; 0·084. Tail length: 0·28; 0·29; 0·29; 0·30. Cloacal diameter: 0·12; 0·12; 0·098; 0·13. Spicule length: 0·19; 0·15; 0·13; 0·16. Gubernaculum length: 0·091; 0·090; 0·104; 0·107. Length of pre-cloacal supplement: 0·066; 0·068; 0·069; 0·068. Distance of pre-cloacal supplement anterior to cloacal opening: 0·24; 0·27; 0·26; 0·28.

FEMALES. Body breadth: 0·12; 0·16; 0·16. Oesophagus length: 0·46; 0·51; 0·67. Diameter of head: 0·041; 0·037; 0·045. Cephalic capsule, posterior diameter/depth: 0·054/0·031; 0·069/0·043; 0·071/0·046. Lengths of cephalic setae: 0·015 and 0·022; 0·016 and 0·028; 0·017 and 0·028. Length of jaws: 0·028; 0·036; 0·041. Eye spots not seen except in 3·4 mm. specimen where they were 0·079 mm. from the anterior end. Tail length: 0·23; 0·25; 0·29. Anal diameter: 0·078; 0·014; 0·013. Distance of vulva from the anterior end: 1·75; 1·78; 2·3. Only the largest female contained eggs, 0·058 × 0·143 mm. in size.

LARVAE. Body breadth: 0·06; 0·16; 0·18. Oesophagus length: 0·36; 0·91; 0·78. Cephalic capsule, posterior diameter/depth: 0·031/0·014; 0·073/0·033; 0·075/0·032. Lengths of cephalic setae: 0·006 and 0·010; ... ; 0·011 and 0·018. Length of jaws: 0·012; 0·022; 0·028. Eye spots 0·09 mm. from the anterior end in the 4·2 mm. long specimen. Tail length: 0·15; 0·27. Anal diameter: 0·045; 0·011; 0·080.

Head and Oesophagus

The head bears six sessile papillae in an internal circle and ten stout setae, in an outer circle, of which six are longer than the others (Text-figs. 1, 3 and 4). The cephalic slits lie slightly ventral and anterior to the lateral setae (Text-figs. 1 and 4). The mouth opening is bounded by three lip-flaps on which lie the inner sessile papillae. The anterior end of the oesophagus carries the usual three large jaws and the edges of the sectors of the oesophagus at the extreme anterior end bear cuticular rod-like structures (Text-fig. 1). The mouth opening is strengthened at the junctions of the lips by three thickened cuticular structures (Text-fig. 1). The cuticle of the anterior end of the body is modified internally to form a cephalic capsule to which the oesophagus is attached at three places, dorsally and ventro-laterally (Text-figs. 1 and 3). The oesophagus is, however, attached to the cephalic capsule completely around its periphery near its anterior end to produce a fairly distinct stomodaeal ring. Wieser (1954*a*) argues that the stomodaeal ring in the Leptosomatidae is derived from the stomodaeal capsule (not present in a developed form in *Enoplus*). That is, it is derived from the anterior end of the oesophagus and this certainly appears to be true in *Enoplus* where the ring can be seen fairly easily



Figs. 1–4. *Enoplus quadridentatus* Berlin, 1853. Fig. 1. *En face* view of head. Note the way in which the oesophagus is attached to the body wall at three points and the way in which the nerves which supply the inner circle of papillae pass through foramina in the stomodaeal ring. Fig. 2. Lateral view of the male tail. Fig. 3. Dorsal view of head. Note the way in which the zone of attachment of oesophagus to the body wall, delimited by broken lines, expands anteriorly. Fig. 4. Lateral view of head with the dorsal surface to the right. Note the attachment of the oesophagus along its dorsal surface.

in *en face* preparations of the head (Text-fig. 1). It should be noted, that in the Leptosomatids Wieser thinks that the stomodaeal ring is not attached to the cephalic capsule along its whole circumference but is separated from it along the radial portions. In *Enoplus*, although the oesophagus is attached to the cephalic capsule at three points, the oesophagus is definitely attached to the cephalic capsule around the whole of its circumference at the level of the stomodaeal ring. As a result there are six foramina present through which pass the nerves which supply the inner sessile papillae, foramina which are bounded internally by the oesophagus and externally by the cuticle of the cephalic capsule (Text-fig. 1). It is these foramina which are figured by de Man (1886) as the inner papillae (de Man, pl. I, fig. 4) and the inner papillae themselves are not shown (see the further discussion of this above, p. 213).

Male

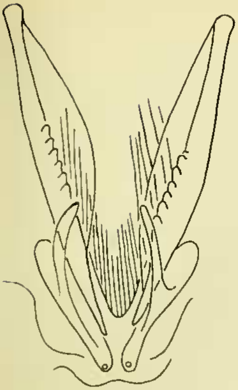
The spicules are equal in length and identical in structure with a series of plates developed on their ventral surfaces (Text-figs. 2 and 5). The number of plates present varies between five and eight. Distal to the plates and lateral in position each spicule always carries a small but distinct lateral process. The gubernaculum consists of three pieces, two lateral and one median ventral in position. The lateral pieces are fairly massive, blunt distally and each bears a distinct apophysis on its ventral surface about half-way along its length (Text-figs. 2 and 5). The median ventral piece is less obvious but is developed proximally into a large series of long hair-like structures which give the gubernaculum a beard-like appearance, particularly when viewed from the ventral aspect. The pre-cloacal supplement is fairly prominent, approximately the same distance as the length of the tail anterior to the cloacal opening (Text-fig. 6) and there is a series of pairs of relatively long setae on the ventral surface of the body anterior to the cloacal opening. There are in addition two pairs of slightly stouter, but otherwise similar setae carried on the posterior lip of the cloacal opening and there are many smaller setae scattered over the general surface of the tail. The tail is relatively short and stout, narrowing evenly, and rather rapidly about one-third of its length posterior to the cloacal opening. There are two opposed, non-reflexed testes of which the more anterior is slightly longer than the more posterior.

Female

The reproductive system is double with opposed, reflexed ovaries which lead into relatively large uteri. There do not appear to be any special spermathecal modifications of the reproductive tract. An egg has been seen in only one specimen and only one egg was present.

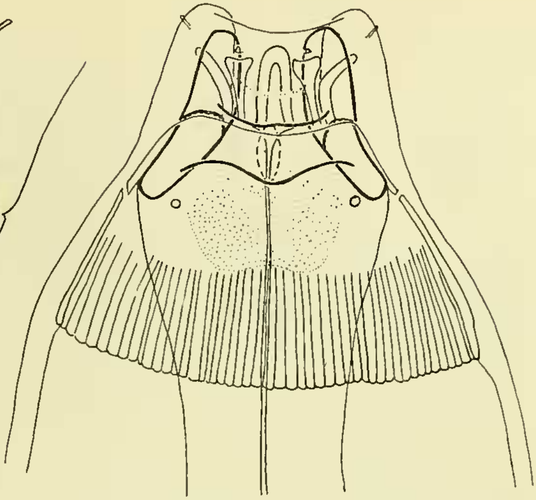
Discussion

This species has been previously recorded from Banyuls-sur-Mer by Allgén (1942) under the name *Enoplus hirtus* (Marion, 1870) with *E. quadridentatus* listed as a synonym. Similarly De Coninck & Schuurmans Stekhoven (1933) list *E. quadridentatus* as a synonym of *E. hirtus*. I am in agreement with these authors that the

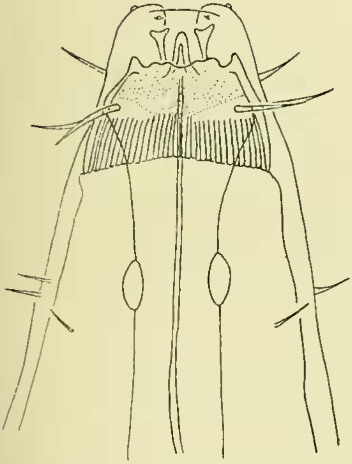


5

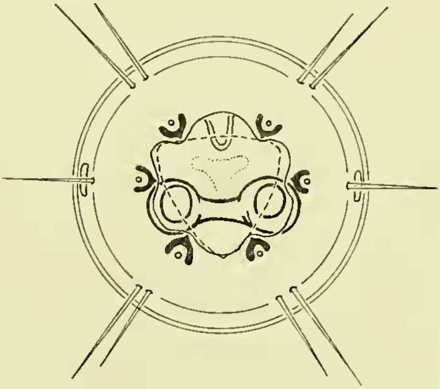
6



7



8



9

FIGS. 5–6. *Enoplus quadridentatus* (continued). Fig. 5. Ventral view of spicules and gubernaculum. Fig. 6. Detail of pre-cloacal supplement from the lateral aspect.

FIGS. 7–9. *Phanoderma parafilipjevi* Allgén, 1939. Fig. 7. Ventral view of head. Fig. 8. Dorsal view of head showing the position of the eye spots. Fig. 9. *En face* view of head. The triangular shape outlined by dashes represents the outline of the buccal cavity while the six-lobed solid line represents the limits of the mouth opening. Note the way in which the papillae of the inner circle are enfolded by the bifurcate anterior ends of the six rod-like developments of the lining of the buccal cavity.

two names are synonymous but the name to be employed must be *E. quadridentatus*. Allgén (1942) lists *E. tridentatus* Dujardin, 1845 as a synonym of *E. hirtus* while De Coninck & Schuurmans Stekhoven (1933) suggest that possibly the two are indistinguishable. However, the description given by Dujardin is insufficient to allow the status of his specimens to be established and I propose to treat the name *Enoplus tridentatus* as that of a *species dubia*. *Enoplus euxinus* Filipjev, 1918, is also indistinguishable from *E. quadridentatus*.

Phanoderma parafilipjevi Allgén, 1939

Material Studied

2 ♂, 1 ♀, 22 larvae. B.M. (N.H.), Reg. Nos. 1961.335–347 and 1961.376–384. In addition many specimens were studied alive at Banyuls-sur-Mer.

	Ratios				
	a	*b*	*c*	V	Body length
Male . .	27·5	4·1	36·4	—	5·1
Larvae . .	34·1	3·1	17·6	—	1·5
	25·0	3·2	25·0	—	3·5

Measurements (in mm. ; in order of body lengths)

Male. Body breadth : 0·186. Oesophagus length : 1·24. Diameter of head : 0·030. Diameter of head at base of cephalic capsule : 0·053. Depth of cephalic capsule : 0·042. Nerve ring from the anterior end : 0·40. Excretory pore from the anterior end : 0·115. Eye spots from the anterior end : 0·046. Tail length : 0·14. Cloacal diameter : 0·069. Length of spicules : 0·19. Length of gubernaculum : 0·067. Length of pre-cloacal supplement : 0·046. Distance of pre-cloacal supplement anterior to cloacal opening : 0·22.

Larvae. Body breadth : 0·044 ; 0·14. Oesophagus length : 0·49 ; 1·1. Diameter of head : 0·009 ; 0·014. Diameter of head at base of cephalic capsule : 0·022 ; 0·049. Depth of cephalic capsule : 0·019 ; 0·026. Nerve ring from the anterior end : ... ; 0·35. Excretory pore from the anterior end : 0·096 ; 0·13. Eye spots from the anterior end : 0·031 ; 0·040. Tail length : 0·085 ; 0·14. Anal diameter : 0·032 ; 0·060.

This species was, as with many of the others, studied in detail while alive but the importance of the structures seen, particularly those of the head, was not appreciated at that time. Since then it has become clear that a redescription, particularly of the structure of the head, is required but, unfortunately, no measurements were taken at Banyuls and I have been able to find relatively few specimens among the material brought back to London. As a result I am unable to give measurements for females since the single female noted above is in a poor condition and I have measurements for only one male.

This species was originally described by Allgén (1939) but, as Wieser (1953*a*) points out, the description is poor, particularly with reference to the structure of the head. It is, however, adequate for the recognition of the species. It may be pointed out in anticipation of the description which follows that the structure of the head is remarkable in that the mouth opening is supported by six cuticular rod-like structures which do not appear to have been previously mentioned in connection with this genus.

Head and Oesophagus

The head, in spite of the great length of the body in adult specimens, is small and extremely complicated. It bears an inner circle of six sessile papillae and an outer circle of ten setae of which four are long and six are short. The amphids are small, pocket-like and lateral in position. No cephalic slits have been seen. The mouth opening is large and roughly hexagonal with six poorly-defined lip-lobes each of which is supported by a cuticular rod-like structure which is bifurcate anteriorly so that, when viewed *en face*, the papillae of the inner circle appear to be embraced by a cuticular horse-shoe (Text-fig. 9). These cuticular rods are modifications of the inner cuticular covering of the buccal cavity (Text-fig. 7). The mouth opening leads into a buccal cavity, triangular in cross-section (Text-fig. 9), into which project three cuticular tooth-like structures derived from the cuticular covering, i.e. pharyngeal capsule, of the anterior end of the oesophagus. The dorsal tooth-like structure is relatively small while the two ventro-lateral paired structures are very massive. The latter structures arise from a thickened basal portion which is the ventral part of the stomodaeal capsule. Thus the anterior end of the oesophagus bears a strongly developed stomodaeal capsule which is much more strongly developed ventrally than it is dorsally. Laterally the stomodaeal capsule is developed posteriorly on each side of each amphid as a distinct, narrow process. This is shown in Text-fig. 13 in which only the stomodaeal capsule is shown, from the lateral aspect. Dorsally the capsule is poorly developed and its full extent has not been definitely established so that in Text-fig. 13 the dotted dorsal part of the capsule is uncertain. The external cuticle covering the anterior end of the body is modified as a cephalic capsule which finishes anteriorly about the level of the anterior end of the stomodaeal capsule at which the three tooth-like structures become distinct. Posteriorly the cephalic capsule is marked by striations, this being the part called by Wieser (1953) the cervical capsule but it is definitely the posterior part of the cephalic capsule (Text-figs. 7, 8 and 12). The two capsules are fused over the whole of the pharyngeal capsule and the oesophagus may possibly be attached to the cephalic capsule more posteriorly as well. In some specimens the area between the cervical capsule and the pharyngeal capsule shows a distinct dotting which suggests a fusion and, further, this dotting appears in some specimens to cover a restricted zone as shown in Text-figs. 7 and 8 but I cannot be sure whether this is the true condition or not as it may have been due to the condition of the specimens studied. Nevertheless, the fusion between the two capsules occurs over a larger area than in the case of *Enoplus* although even here the fusion appears to begin posteriorly in three regions which expand until the capsules are fused completely around the periphery of the body. It should be noted that the shape of the pharyngeal capsule is such that the setae always originate posterior to its posterior edge (Text-figs. 7, 8 and 12). The eye spots are well developed and the oesophagus has the typical cellular appearance posteriorly (Text-fig. 11). The excretory pore is anterior to the nerve ring, e.g. in a larva 2·85 mm. long the oesophagus is 0·79 mm. long, the eye spots are 0·033 mm. from the anterior end, the excretory pore opens 0·11 mm. from the anterior end and the nerve ring is 0·31 mm. from the anterior end.

Male

The spicules are equal in length and identical in structure with plates developed on their posterior ends (Text-fig. 10). There are from five to nine such plates which are restricted to a relatively short zone. The spicules are long and narrow, the pre-cloacal supplement is relatively prominent and simple (Text-fig. 10) and the gubernaculum is relatively short with fairly large, plate-like lateral portions (Text-fig. 10). There are two rows of prominent setae, latero-ventral in position, on the surface of the body anterior to the cloacal opening and there are several prominent setae scattered over the surface of the tail (Text-fig. 10). The caudal glands lie posterior to and on a level with the cloacal opening.

Discussion

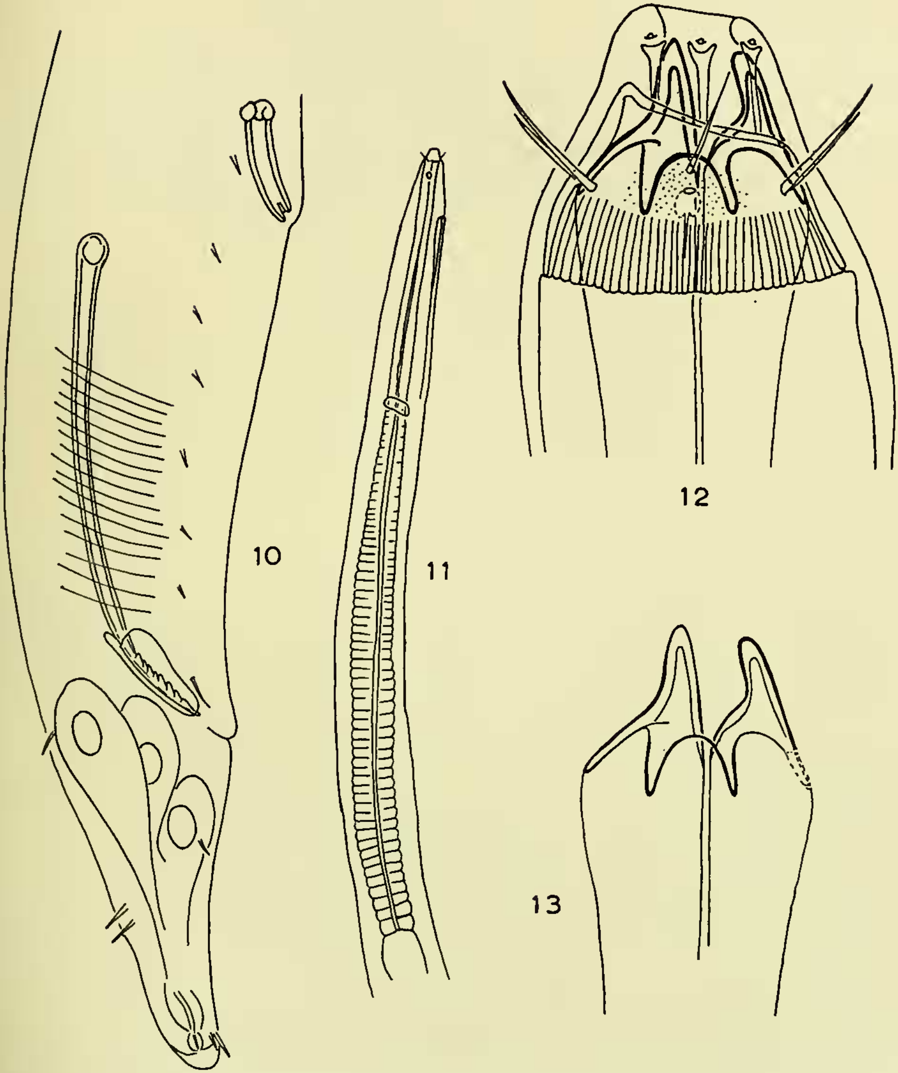
Wieser (1953*a*) surmises correctly that this species possesses a cervical capsule as is reported above. However, I have been unable to find a report of the cuticular bifurcate rods, which support the mouth opening, in any description of species of this or any related genus. Timm (1953) reports the presence of twelve cuticular rod-like structures in the anterior end of the oesophagus of *Leptosomatum acephalatum* Chitwood, 1936, but only in the female. There is a sexual dimorphism in this species as the male is not equipped with similar structures. This is not the case of *Phanoderma parafilipjevi*, the rods are present in both sexes as in *Leptosomatum ranjhai* Timm, 1960. *P. parafilipjevi* also differs in that the rods are not developed from the oesophagus but lie in the inner wall of the buccal cavity. Thus they also differ from the condition found in some Leptosomatids where there is a well-developed anterior part of the cephalic capsule anterior to the stomodaeal ring. The occurrence of these structures in at least one species of *Phanoderma* can contribute little to the taxonomy of the free-living nematodes so long as it remains an isolated record but it demonstrates the poverty of the available descriptions.

Oncholaimus dujardinii de Man, 1876

Material Studied

4 ♂, 6 ♀, 7 larvae. B.M. (N.H.), Reg. Nos. 1961.210–226.

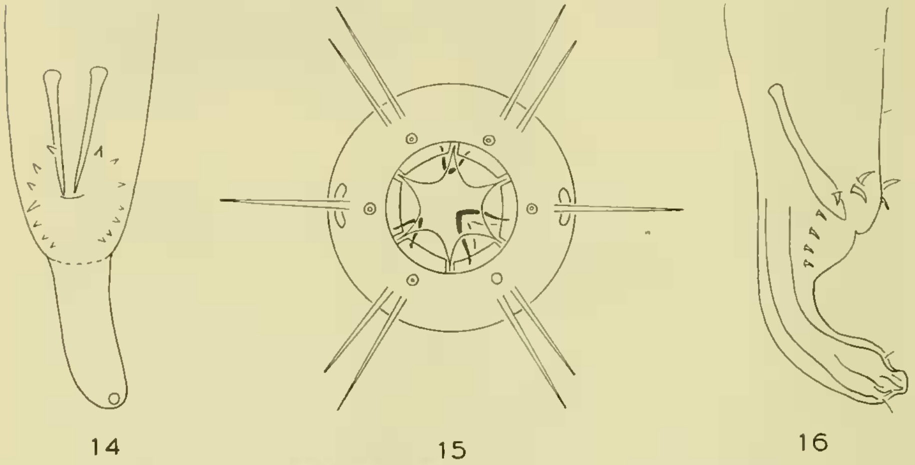
This, as is pointed out by Schuurmans Stekhoven (1950), is one of the most commonly reported species from the Mediterranean. It has been described by several authors and my specimens from Banyuls appear to be wholly typical. It has been previously reported from Banyuls, without description, by Allgén (1942) and full details of its reported occurrence within the Mediterranean are given by Schuurmans Stekhoven (1950). I, therefore, restrict this description to some figures, particularly of the shape of the spicules (Text-figs. 14 and 16) which do not appear to have been figured wholly accurately before, and an *en face* view of the head which has not been figured before (Text-fig. 15).



FIGS. 10–13. *Phanoderma parafilipjevi* (continued). Fig. 10. Male tail from the lateral aspect. Fig. 11. Oesophagus from the lateral aspect. Fig. 12. Lateral view of head. Fig. 13. Detail of the anterior end of oesophagus showing the shape of the pharyngeal capsule.

Discussion

Wieser (1955) lists this species among those which he considers to have a "... more or less cosmopolitan distribution" but, as Schuurmans Stekhoven (1950) points out, Steiner's (1915) description of *O. dujardinii* from Sumatra mentions the presence of a gubernaculum. Because of this Schuurmans Stekhoven, who was unable to find a gubernaculum in his Mediterranean specimens, proposed the name *O. steineri* for the species with a gubernaculum. I have also been unable to find any trace of a gubernaculum and agree with Schuurmans Stekhoven that *O. steineri* is a good species distinct from *O. dujardinii*. This view is supported by Ditlevsen's (1926) description of *O. groenlandicus* sp. nov., in which he found no trace of a gubernaculum, which is almost certainly indistinguishable from *O. dujardinii*.



FIGS. 14–16. *Oncholaimus dujardinii* de Man, 1876. Fig. 14. Ventral view of male tail. Fig. 15. *En face* view of head. Fig. 16. Male tail from the lateral aspect.

Wieser's (1953*a*) and Mawson's (1958) descriptions of *O. dujardinii* from Chile and the Subantarctic, in both of which a gubernaculum is figured and described, lend further support to this view. I treat both these records as almost certainly referring to *O. steineri*. The accessory sense organ near the tip of the male tail which is described by Steiner may be simply some small setae, such as are scattered generally over the surface of the tail, but his figure (taf. 24, fig. 29) suggests something more complex. Such a structure also appears to be illustrated in the figure given by Wieser (1953*a*, fig. 68*b*) and that given by Mawson (1958, fig. 28*b*). Wieser also treats some nominal species as synonyms of *O. dujardinii* but their status must be considered most uncertain. Thus, the description of *O. exilis* Cobb, 1889 is, as Wieser points out, unsatisfactory and without figures. I cannot accept it as a synonym of *O. dujardinii* but prefer to treat it as a *species dubia*. Similarly with Ditlevsen's (1930) species, *O. bollonsi* from New Zealand, I cannot accept that " there is no doubt that *O. bollonsi* is identical with *O. dujardini* " (Wieser, 1953*a* : 116). It may be indistinguishable from *O. steineri*—in which case the specific name *bollonsi* would have priority—but, until the male is known, it is better to treat it as a *species inquirenda*. Allgén (1959) records *O. dujardinii*, without description, from the Fuegian Archipelago, the Falkland Islands and from South Georgia but I consider it more probable that he actually had *O. steineri* but as this cannot be confirmed I treat these records as valueless (see p. 00).

To return to Wieser's (1955) record, as it is without a description the status of his specimens cannot be established and his contention that *O. dujardinii* falls into the group of cosmopolitan species of nematodes is unfounded.

Prooncholaimus banyulensis sp. nov.

Material Studied

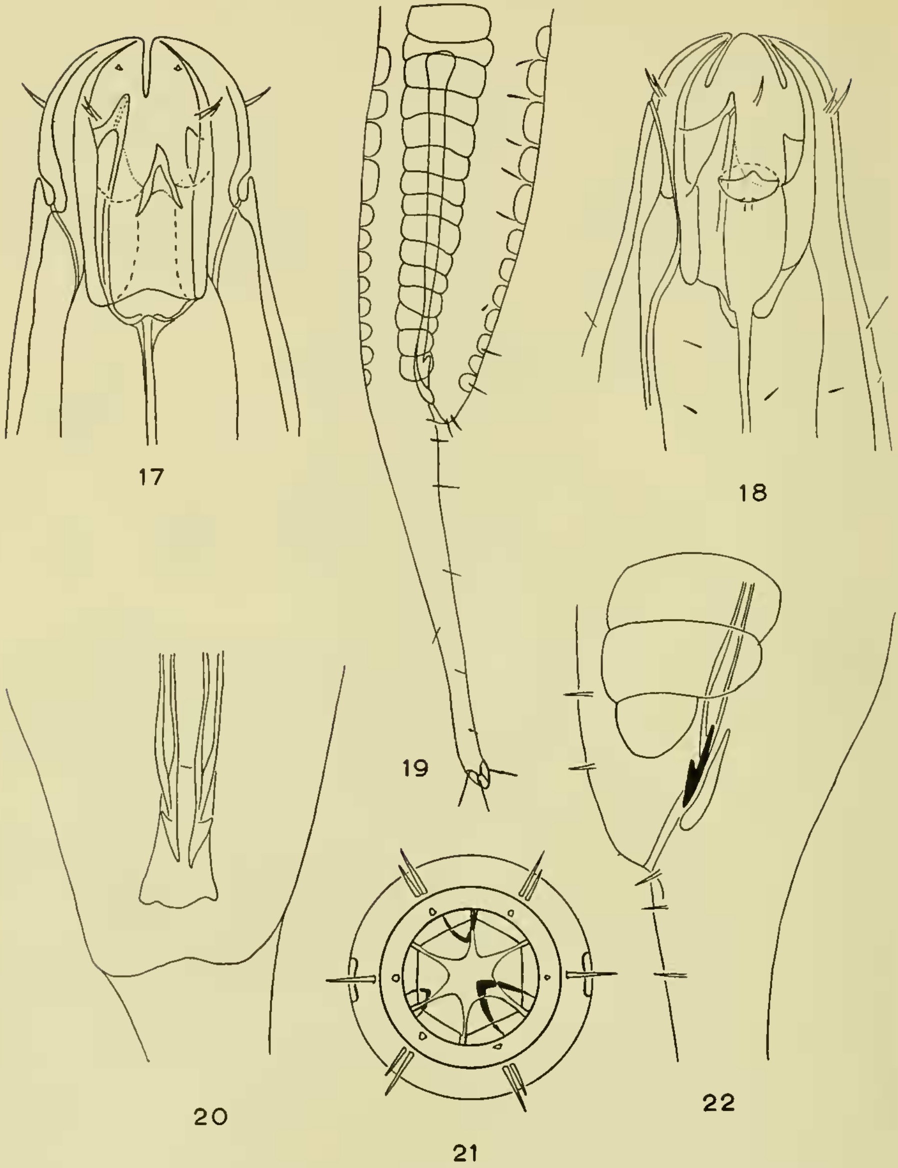
2 ♂, 1 larva. B.M. (N.H.), Reg. Nos. 1961.360–362. Holotype ♂, 1961.360.

	Ratios			
	a	*b*	*c*	Body length
Males . .	32·8	6·1	20·3	3·25
	33·3	6·6	21·4	3·60
Larva . .	31·5	5·5	15·5	2·33

Measurements (in mm. ; in order of body lengths)

MALES. Body breadth : 0·099 ; 0·108. Oesophagus length : 0·53 ; 0·55. Diameter of head at level of setae : 0·033 ; 0·032. Diameter of body at level of amphids : 0·041 ; 0·039. Length of cephalic setae : 0·005 and 0·007 ; 0·005 and 0·007. Distance of amphids from anterior end : 0·023 ; 0·026. Total length of buccal cavity : 0·049 ; 0·049. Length of first part of buccal cavity : 0·030 ; 0·029. Breadth of first and second parts of buccal cavity : 0·019 and 0·017 ; 0·021 and 0·014. Length of dorsal tooth : 0·034 ; 0·034. Length of left ventro-lateral tooth : 0·040 ; 0·036. Length of right ventro-lateral tooth : 0·033 ; 0·029. Nerve ring from anterior end : 0·27 ; 0·29. Excretory pore from anterior end : 0·015 ; 0·013. Tail length : 0·16 ; 0·17. Cloacal diameter (across anterior lip and across posterior lip) : 0·031 and 0·026 ; 0·035 and 0·026. Spicule length : 0·116 ; 0·139. Gubernaculum length : 0·019 ; 0·018. The cuticular inflations start 0·087 mm. from the anterior end on the 3·25 specimen and are 0·051 mm. wide at the mid-point of the body length.

LARVA. Body breadth : 0·074. Oesophagus length : 0·42. Diameter of head at level of setae : 0·027. Diameter of body at level of amphids : 0·034. Cephalic setae not measured. Total length of buccal cavity : 0·039. Length of first part of buccal cavity : 0·022. Breadth of first and second parts of buccal cavity : 0·017 and 0·011. Length of dorsal tooth : 0·024. Length of left ventro-lateral tooth : 0·031. Length of right ventro-lateral tooth : 0·026. Nerve ring from anterior end : 0·24. Excretory pore from anterior end : 0·010. Tail length : 0·15. Cloacal diameter (across anterior lip and across posterior lip) : 0·029 and 0·023.



Figs. 17–22. *Prooncholaimus banyulensis* sp. nov. Fig. 17. Dorsal view of head. Fig. 18. Lateral view of head with the dorsal surface to the right. Fig. 19. Male tail from the lateral aspect. Fig. 20. Ventral detail of gubernaculum and tips of spicules. Fig. 21. *En face* view of head. Fig. 22. Lateral detail of gubernaculum and tips of spicules.

The cuticular inflation which occurs on the lateral and the dorsal and ventral surfaces is most prominent in all the specimens (Text-fig. 19). The body is marked by faint, close-set striations and contracts very sharply at the level of the cloacal opening so that the opening is covered anteriorly by a very thick ledge-like lip (Text-fig. 19).

Head and Oesophagus

The anterior end of the body is smoothly rounded and carries six small, semi-sessile papillae in the inner circle and an outer circle composed of six long setae and four shorter setae (Text-figs. 17, 18 and 21). The longer setae are about 1·4 times longer than the shorter in the adults. (It was not possible to measure them in the larva.) The mouth opening is large and is surrounded by six prominent lip-lobes. The buccal cavity is circular in cross-section and is developed into six lobes anteriorly, one corresponding to each lip-lobe. Within the buccal cavity are the usual three teeth of which the left ventro-lateral is the longest. The amphids lie about the level of the origins of the smaller teeth and the excretory pore opens just posterior to the cephalic setae. The oesophagus expands slightly along its entire length, there is no posterior bulb or distinct swelling and the nerve ring encircles it about half-way along its length. There are several short setae distributed over the oesophageal part of the body.

Tail

The tail is very characteristic. It contracts very sharply immediately posterior to the anal or cloacal opening, narrows evenly towards the posterior end and terminates in a very slight swelling. The anterior lip of the cloacal opening rises suddenly above the opening so that there is a sudden step in the outline of the ventral surface of the body at this point, when viewed from the lateral aspect (Text-figs. 19, 20 and 22).

Male

There is a series of stout setae around the cloacal opening, three pairs flanking the opening, two pairs arranged linearly just posterior to it and three pairs anterior to it (Text-figs. 19 and 22). In addition there are some long setae scattered over the posterior end of the body to just anterior to the anterior ends of the spicules. Similar, but shorter, setae occur on the tail proper.

The spicules are equal in length and identical in structure with distinct barbs on their posterior ends (Text-figs. 20 and 22). They are fairly stout anteriorly and narrow evenly towards their posterior ends where they swell slightly before constricting rather sharply just before the posterior barbs. The barbs are much more heavily cuticularized than the remainder of the spicules and are a deep brown in colour when cleared with glycerine, the remaining parts of the spicules being pale and translucent. The barbs are developed anteriorly into distinct narrow strips which run for a short distance along the sides of the more anterior parts of the spicules (Text-fig. 22). There is a short, simple gubernaculum which expands posteriorly where it is slightly tri-lobed (Text-fig. 20).

Discussion

This species is most similar to *P. eberthi* (Filipjev, 1918) and to *P. mediterraneus* Schuurmans Stekhoven, 1943 but appears to differ from them both in the structure of the spicules and, perhaps a less important character, in the shape of the tail. It is extremely difficult to be sure since the descriptions available of both species are somewhat sketchy. Nevertheless the form of the posterior ends of the spicules in *P. banyulensis* is so distinctive that it can be seen easily at low magnifications and it is difficult to believe that Filipjev could have drawn them as he has the posterior ends of the spicules of *P. eberthi* (Filipjev, 1921, pl. 4, fig. 27). Similarly, Schuurmans Stekhoven's (1950) figure of the spicules, which does not agree with his earlier figure (1943, fig. 15*d*), shows spicules with much less prominently modified ends. Schuurmans Stekhoven (1950) lays considerable stress on certain ratios in delimiting his species from that of Filipjev. I am extremely sceptical as to the value of using ratios in this way, particularly as Schuurmans Stekhoven only uses one ratio in all cases. Nevertheless in many of these ratios *P. banyulensis* differs from both *P. mediterraneus* and *P. eberthi*. However, Schuurmans Stekhoven uses the anal diameter as a reference measurement in several of his ratios and I do not know which diameter he measured ; across the large anterior lip of the cloacal opening or around the tail immediately posterior to the cloacal opening. I will, therefore, give two ratios for *P. banyulensis*, the first based on the measurement including the anterior lip and the other not including it. It is clear that, using this reference point the spicules of *P. banyulensis* are relatively, as well as absolutely, shorter than those of *P. mediterraneus*. The ratio of spicule length/anal diameter for the latter species is 6·6 while in *P. banyulensis* it is 3·7 or 4·5 (3·25 mm. long specimen) and in *P. eberthi* it is 5·0. Schuurmans Stekhoven also lays stress on the relative dimensions of the buccal cavity. In males of *P. mediterraneus* he gives the ratio of the length of the buccal cavity to its greatest width as 2·5–3·0, in *P. eberthi* as 2·37 while in *P. banyulensis* the same ratio is 1·6 in both adult specimens.

Prooncholaimus banyulensis is, therefore, characterized by relatively short spicules with distinct, heavily cuticularized, sharply pointed barbs on their posterior ends and by a relatively narrow buccal cavity.

Symplocostoma tenuicolle (Eberth, 1863)

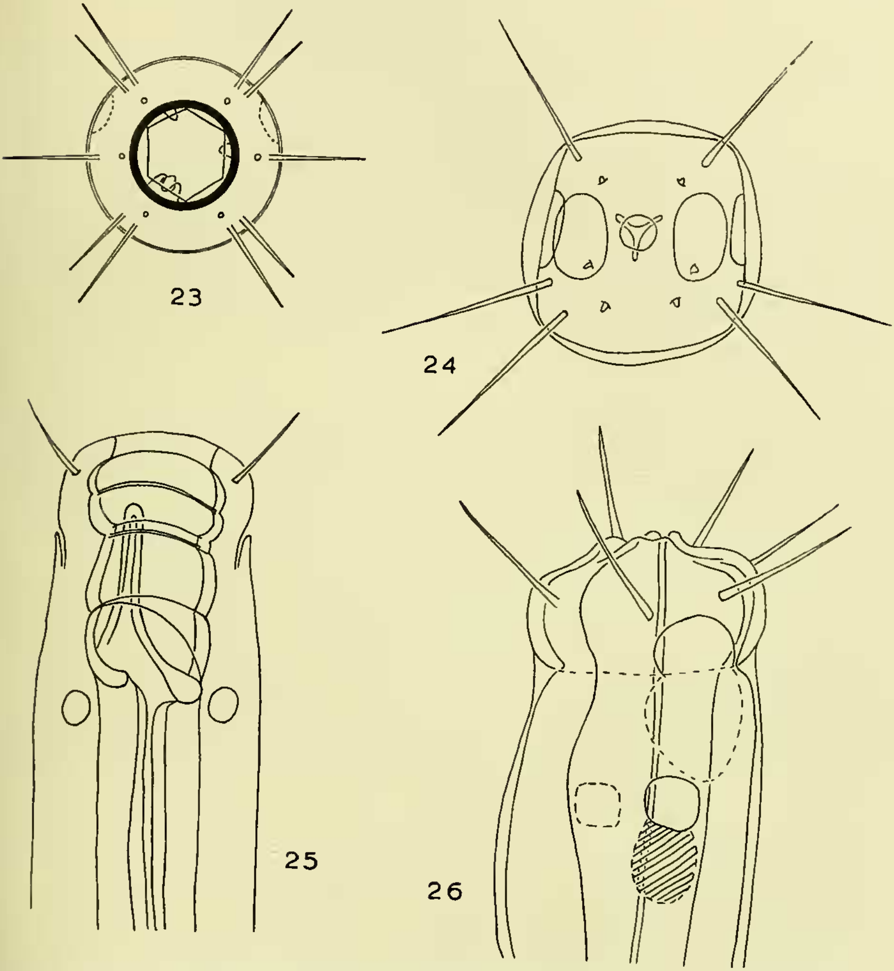
Material Studied

2 ♂, 5 ♀, 8 larvae. B.M. (N.H.), Reg. Nos. 1961.363–368.

This species has been considered in great detail by Wieser (1953) and I restrict myself to a few observations on the structure of the head. It is, however, worth noting that the female reproductive apparatus is double with opposed reflexed ovaries and that the uteri may contain up to ten eggs at one time.

The Head

In this genus, in fact in the entire subfamily Enchelidiinae, there is according to Wieser (1953*a*, 1954*a*) a marked sexual dimorphism. Such a dimorphism is exhibited by this species in which the buccal cavity is prominently developed in the female (Text-fig. 25) but is totally lacking in the male (Text-fig. 26). In the female the mouth opening is hexagonal and the long narrow buccal cavity contains three teeth of which the right ventro-lateral is much larger than the others. The large tooth, when viewed in *en face* preparations, appears to be doubled at the anterior end but this appears to be due to an optical section effect (Text-fig. 23). It should be noted that in this species, as in *Polygastrophora omercooperi* Inglis, 1961, the smaller



Figs. 23–26. *Symplocostoma tenuicolle* (Eberth, 1863). Fig. 23. *En face* view of female head. Fig. 24. *En face* view of male head. Fig. 25. Dorsal view of female head. Fig. 26. Lateral view of male head with the dorsal surface to the right.

dorsal and left ventro-lateral teeth are directed towards each other when viewed *en face*. The amphids are dorso-lateral in position. In the male head the buccal capsule and teeth are totally lacking, although they are present in the fourth-stage larva. Instead the oesophagus continues to the anterior end of the body which is modified as a distinct cap (Text-fig. 26) which appears to be due to the oesophagus being attached to the covering of the body wall in a way analogous to that found in *Enoplus* and *Phanoderma*, although this is uncertain due to lack of specimens. No trace was seen of the cephalic cap-like structure figured by Filipjev (1918–21, pl. 4, figs. 28*a* and *b*). When studied *en face* the male head appears to be even more remarkable (Text-fig. 24). There is a marked asymmetry of the distribution of the six long setae so that the lateral members are more ventro-lateral than is usual and the amphids, which are distinctly dorso-lateral in position on the female head, are almost wholly lateral in position. This asymmetry also affects the inner circle of sessile papillae but not to the same marked extent as the setae. It should also be noted that the female head bears ten setae while the male head appears to have only six. The mouth opening is circular and small.

Discussion

The form of the male head is most remarkable and it is unfortunate that I have only been able to study one *en face* preparation. The asymmetry reported may be due to faulty technique but I am not wholly convinced that this is the explanation. The result is sufficiently startling to warrant this brief mention in the hope that some other worker may be able to check it and confirm or refute my observations.

Eurystomina pettiti sp. nov.

(?) *Eurystomina assimilis* of Schuurmans Stekhoven, 1943, pp. 348–349. Fig. 19*c* (in part).

Material Studied

4 ♂, 1 ♀, 8 larvae. B.M. (N.H.), Reg. Nos. 1961.6–10. Holotype male, 1961.6.

	a	*b*	*c*	V	Body length
Males	67·4	4·8	30·7	—	3·1
	69·3	5·0	32·9	—	3·2
	66·1	5·1	36·8	—	3·2
One suppl.	68·8	4·6	30·6	—	3·3
Female	53·7	4·7	27·1	55·0	3·2
Larvae	51·2	3·6	19·6	—	1·3
4th stage	56·3	4·1	32·5	58·7	3·2

Measurements (in mm. in order of body lengths above).

MALES. Oesophagus length: 0·64; 0·64; 0·64; 0·71. Buccal cavity depth: ...; 0·014; 0·014; 0·015. Buccal cavity width, first part ...; 0·010; 0·009; 0·010; second part: ...; 0·009; 0·009; 0·010. Length of longest tooth: 0·011; 0·010; 0·010; 0·012. Lengths of cephalic setae (long only):

0·010 ; 0·011 ; 0·010 (short 0·007) ; 0·009. Nerve ring from anterior end : 0·27 ; 0·24 ; 0·24 ; 0·24. Excretory pore from anterior end : . . . ; . . . ; immediately posterior to lips ; immediately posterior to lips. Diameter of head : 0·018 ; 0·015 ; 0·015 ; 0·017. Tail length : 0·101 ; 0·097 ; 0·086 ; 0·108. Anal diameter : 0·049 ; 0·044 ; 0·044 ; 0·045. Spicule length : 0·056 ; 0·060 ; 0·057 ; 0·057. Gubernaculum length : 0·031 ; 0·032 ; 0·028 ; 0·032. Distance of pre-cloacal supplements anterior to cloaca ; first : 0·071 ; 0·091 ; 0·074 ; 0·072 (only one) ; second : 0·124 ; 0·150 ; 0·115 ; second lacking.

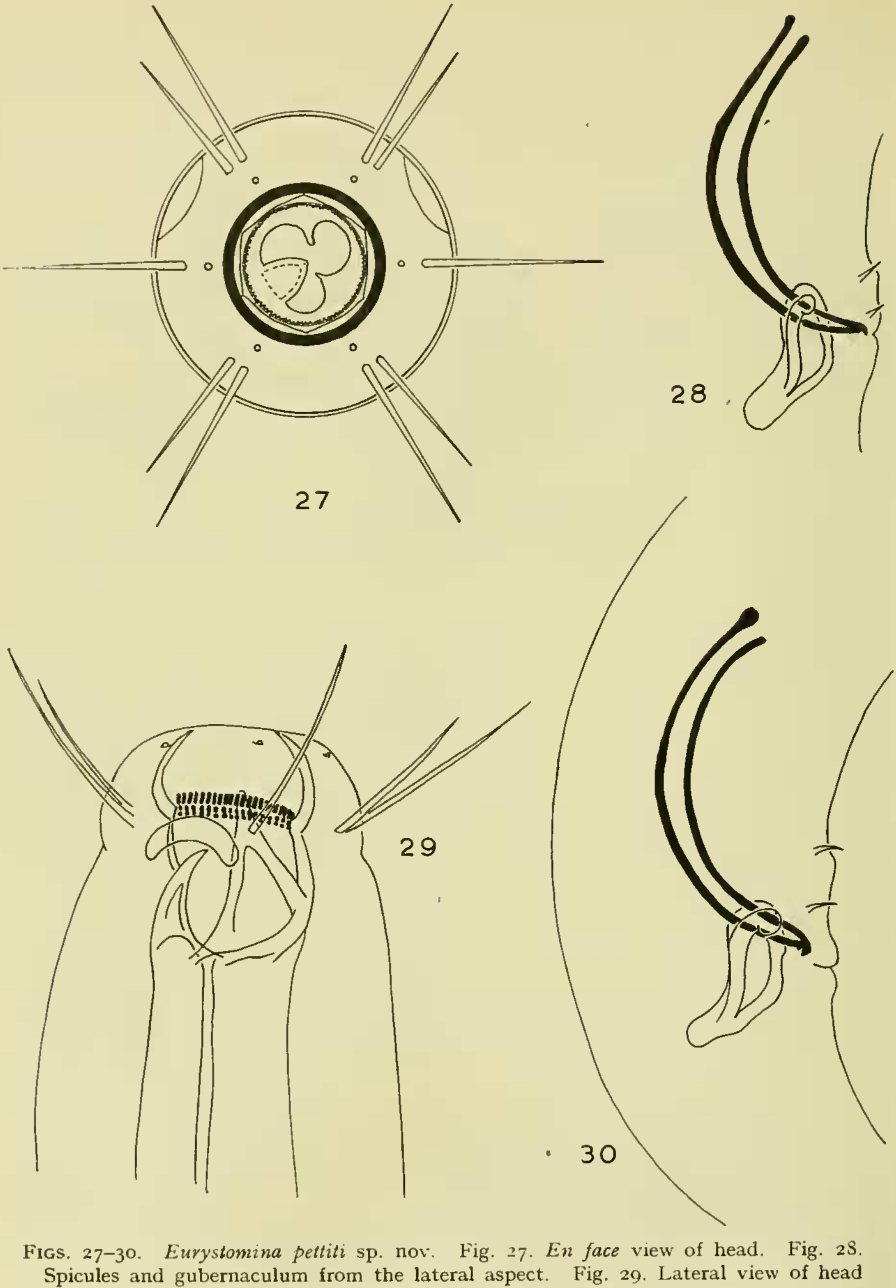
FEMALES. Oesophagus length : 0·68. Buccal cavity depth : 0·017. Buccal cavity width, first part : 0·010 ; second part : 0·008. Length of longest tooth : 0·012. Lengths of cephalic setae : 0·011 and 0·008. Nerve ring from anterior end : 0·25. Excretory pore from anterior end : 0·006. Diameter of head : 0·15. Tail length : 0·117. Anal diameter : 0·032. Vulva from anterior end : 1·76.

LARVAE. Oesophagus length : 0·37 ; 0·76. Buccal cavity depth : 0·010 ; 0·013. Buccal cavity width, first part : 0·007 ; 0·008 ; second part : 0·005 ; 0·007. Length of longest tooth : 0·007 ; . . . . Lengths of cephalic setae : 0·005 and 0·003 ; 0·011 and 0·008. Nerve ring from anterior end : 0·168 ; . . . . Excretory pore : immediately posterior to lips ; . . . . Diameter of head : 0·009 ; . . . . Tail length : 0·068 ; 0·097. Anal diameter : 0·018 ; 0·035. Vulva from anterior end : no vulva ; 1·85.

Head and Oesophagus

The head is rounded and is not off-set from the remainder of the body. It carries an outer circle of ten fairly long setae of which six are longer than the remaining four (Text-fig. 27). There is an internal circle of six sessile papillae surrounding the hexagonal mouth opening, which does not appear to be bordered by lips (see also Cobb, 1920). The amphids are fairly prominent, dorso-lateral in position but the nerves which supply them are lateral, as has been pointed out by Chitwood (1960). The mouth leads into a large buccal cavity, with relatively thick, cuticular walls, which is in two parts, a shallow anterior part and a relatively deep posterior chamber. The line of demarcation between these two chambers is marked by three rows of denticles of which those composing the most anterior row appear to be longer than those composing the more posterior rows. The first two rows are complete around the periphery of the cavity but the most posterior row is incomplete. The denticles are lacking along the left dorso-lateral sector, that is the part of the buccal cavity opposite the large ventro-lateral tooth. This large tooth arises from the floor of the buccal cavity in the right ventro-lateral sector, is very broad based and narrows evenly to a sharp point. There are two similar, but very much smaller teeth in the dorsal and left ventro-lateral sectors (Text-figs. 27 and 29).

The oesophagus is relatively long and narrow with no special modification. The excretory pore opens immediately posterior to the cephalic setae and there are several small setae scattered over the general surface of the anterior end of the body but there are none, or very few, posterior to the posterior end of the oesophagus. Eye-spots are present about 0·03 mm. from the anterior end of the body.



FIGS. 27–30. *Eurystomina pettiti* sp. nov. Fig. 27. *En face* view of head. Fig. 28. Spicules and gubernaculum from the lateral aspect. Fig. 29. Lateral view of head with the dorsal surface to the left. Fig. 30. Spicules and gubernaculum of a second specimen from the lateral aspect.

Tail

The tail is roughly the same shape in both sexes. It is relatively short and stout, terminating posteriorly in a bluntly rounded tip. The caudal glands lie far anterior to the anus or cloacal opening.

Male

The spicules are equal in length and identical in structure (Text-figs. 28 and 30). They are evenly curved, without alae and with a slight barb-like swelling on their distal ends such as is shown by Filipjev (1921) in his figure (fig. 29*c*) of " *E. assimilis* ". Cobb (1922) reports that such a modification of the distal ends of the spicules is common. The gubernaculum is relatively massive with a fenestrate ventral mass which projects between the spicules and from which arises two lateral pieces which project on the outer sides of the spicules. These lateral pieces are rather narrow curved structures which are bluntly rounded at their tips (Text-figs. 28 and 30). The gubernaculum is so shaped that the outline of the ventral side is bent almost into a right angle and the proximal end is blunt and rounded (Text-figs. 28 and 30). The two pre-cloacal supplements are present in all the specimens except one and they lie closer to each other than the distance separating the more posterior from the cloacal opening. In the abnormal specimen, with only one supplement, it is clearly the more anterior supplement which has failed to develop. There are several pairs of stout setae on the ventral surface of the body anterior to the cloacal opening of which the first three or four pairs are clumped relatively closer together than the others and are also slightly more lateral in position.

Female

There are two opposed, reflexed ovaries. The eggs are relatively large, 0·129 × 0·046 mm. and 0·131 × 0·048 mm. in size. The only gravid female contains two eggs.

Discussion

Schuurmans Stekhoven (1943) describes what he considered to be *Eurystomina assimilis* but the figures of the male tail suggest that he confused two distinct species (compare Text-figs. 31, *q* and *r*). The first figure suggests *E. gerlachi* while the second suggests the present species and is referred above to the synonymy as a probable synonym.

E. pettiti is characterized as a short-tailed species with eye spots and a gubernaculum which is relatively short, blunt and massive.

Review of the Genus Eurystomina

Marion (1870) creates a new genus, *Eurystoma*, for two new species which he discovered in the Mediterranean, *E. spectabilis* (type species) and *E. tenue*. The generic name is, however, pre-occupied by that for a genus of molluscs and a new

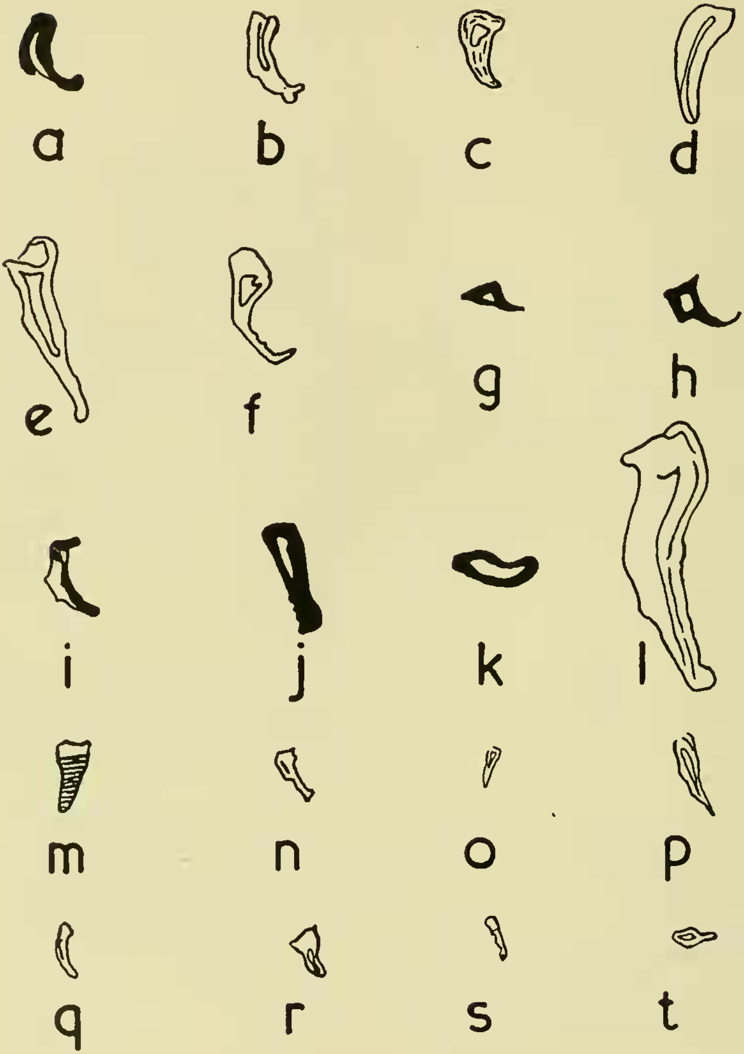


FIG. 31. Lateral views of the gubernacula of various species of *Eurystomina*, redrawn after various authors. The ventral surface of the body is to the left in all the figures. *a*—*E. filiformis* (= *E. assimilis* of Filipjev, 1918, fig. 29*f*) ; *b*—*E. ornata* (= *E. assimilis*

name, *Eurystomina*, is proposed by Filipjev (1921—not 1918 as stated by Filipjev, 1934; Wieser, 1953 and 1953*a*). Cobb (1922) also proposes a new name, *Marionella*, to replace *Eurystomina*. Then Schuurmans Stekhoven (1935) unwarrantably proposes an emendation of the name to *Eurystomatina* and he, and Allgén, continue to use this form.

This review is a direct result of the attempt to identify *E. pettiti* during which it became apparent that many of the characters used in delimiting species within the genus were either misleading or of only doubtful value and that many of the nominal species referred to the genus were based on insufficient specimens or inadequate morphological data. For example Schuurmans Stekhoven (1950) describes a new species, *E. stenolaima*, based on only part of a specimen (the tail, apparently, was missing) and many other species are based on females only. A further indication of this is given by the difficulties involved in identifying and separating the European species (i.e. those from the best known area), *E. ornata*, *E. tenue*, *E. assimilis* and *E. filiformis*, all of which have been considered indistinguishable, in whole or in part, by some authors although I will demonstrate later that at least two of them are distinct species, one is a synonym of another species not in the group, and the fourth is best considered a *species dubia*. Further, *E. ornata* has been reported from many localities outside European waters and several other species have been treated as indistinguishable from it although I will show that such species, i.e. *E. opthalmophora*, *E. ornata* var. *indica* and *E. ornatum* of Wieser, 1955, are in fact distinct from *E. ornata*.

Characters of Value in Delimiting Species

Wieser (1953*a*) states "I should like to emphasize that the best distinguishing characters (in *Eurystomina*) are to be found in the head region and not—contrary to what is the case in most other marine nematodes—in the male genital apparatus. Without a detailed knowledge of the cephalic setae, the transverse rows of denticles in the buccal cavity, the position of the ocelli etc. the status of a given species cannot be defined with certainty." In spite of this Wieser (1953, 1953*a*) refers to the large tooth as being dorsal in position while it is clearly ventro-lateral in position in all

---

of Filipjev, 1918, fig. 29*c*); *c*—*E. opthalmophora* (= *E. ornatum* var. *indicum* Micoletzky, 1930); *d*—*E. opthalmophora* (after Steiner, 1922); *e*—*E. eurylaima* (after Ditlevsen, 1930); *f*—*E. stenolaima* (after Ditlevsen, 1930); *g*—*E. wieseri* sp. nom. nov. (= *E. stenolaima* of Wieser, 1953*a*); *h*—*E. fenestrella* (after Wieser, 1953*a*); *i*—*E. chilensis* sp. nom. nov. (= *E. retrocellatum* of Wieser, 1953*a*); *j*—*E. minutisculae* (after Chitwood, 1951); *k*—*E. chitwoodi* sp. nom. nov. (= *E. americana* of Chitwood, 1951); *l*—*E. filiformis* (after de Man, 1888); *m*—*E. repanda* (after Wieser, 1953*a*); *n*—*E. ornata* (after Eberth, 1863); *o*—*E. spectabilis* (= *E. tenue* of Marion, 1870); *p*—*E. spectabilis* (after Marion, 1870); *q*—*E.* (?) *gerlachi* sp. nom. nov. (after *E. assimile* of Schuurmans Stekhoven, 1943, fig. 19B); *r*—*E.* (?) *pettiti* sp. nov. (after *E. assimile* of Schuurmans Stekhoven, 1943, fig. 19C); *s*—*E. tenuicaudata* (after Allgén, 1931); *t*—*E. americana* (after Chitwood, 1936).

the species in which the head has been adequately described. Mawson (1958) points this out with reference to *E. fenestrella* ; the large tooth is ventro-lateral in *E. pettiti* (see below) ; Luc and De Coninck (1959) show it so in *E. ornatum* and Cobb (1922) reports that in all the species he studied the large tooth was invariably right ventro-lateral in position. It is also right ventro-lateral in *E. pettiti* and appears to be so positioned in all the figures I have seen, except that given by Luc and De Coninck (1959) who show it to be left ventro-lateral. The importance of this is not clear since the two authors may have been in error or it may indicate that the large tooth may be either left or right ventro-lateral but it is quite clear that whichever side it may occupy the large tooth is always ventro-lateral.

The greatest difficulty about using the structure of the head in the delimitation of species within this genus is that the head tends to be small and is extremely difficult to study so that one cannot be sure that all the structures, for example rows of small denticles, have been seen. In studying *E. pettiti* the three rows of denticles could not be seen in all the specimens but I am quite sure that this does not indicate that I was studying several species but only that the condition of the specimens was such that it was impossible to establish the presence of all the structures. The presence or absence of ocellae is much more difficult to assess since they may easily be dissolved out in the storage fluid and their occurrence cannot, I feel, be treated as a character of any great significance. Thus the first dichotomy in Wieser's key (1953*a* : 135) is probably without significance, as he appreciates himself.

In spite of the criticism of the value of the male genital apparatus by Wieser (1953*a*), quoted above, and his further comment, after redescribing what he considers to be *E. retrocellata*, that " The male genital apparatus provides no good distinguishing character ; . . ." I would suggest that, in fact, the male genital apparatus affords very good characters, particularly the form of the gubernaculum. This suggestion is advanced from a study of the literature but is supported by the relative ease with which it is possible to separate species previously considered to be indistinguishable and the apparent degree of constancy in the shape of the gubernaculum when figures by different authors are compared. Compare, for example, Eberth's figure of the gubernaculum of *E. ornata* (fig. 31, *n*) with that by Filipjev (1918, fig. 31, *b*) of what he considered to be *E. assimilis* ; also compare the other gubernaculum figured by Filipjev as *E. assimilis* (fig. 31, *a*) with that of *E. filiformis* (fig. 31, *l*). In fact a superficial glance at the various figures of the gubernaculum which are redrawn as Text-figs. 31 and 32 is sufficient to establish my thesis.

Attempts to use measurements and ratios in delimiting nematode species are fraught with difficulties since they are, as in any group of soft-bodied animals, liable to considerable distortion during fixation. The possible effects of this have been discussed in detail elsewhere (Inglis, 1958) but I would point out that I look on almost all attempts to separate species on the basis of measurements or ratios, whether largely or alone, as suspect.

Biblio-systematic studies, such as this review, are always fraught with danger but the results are interesting and supply a more rational basis for the delimitation of species within the genus *Eurystomina* than that available at present. It may be objected that in dismissing records based on females or juveniles I have been excessive but it is quite clear that if this is not done now, while the study of the free-living nematodes is in an early stage, the position will simply become more difficult instead of easier since the way in which many species, particularly the European which have been most extensively studied, have been confused shows quite clearly the, I suspect, insurmountable difficulties involved in delimiting species on the only characters which are available in the females, the structure of the head, the position of the eye spots, various measurements and ratios, etc.

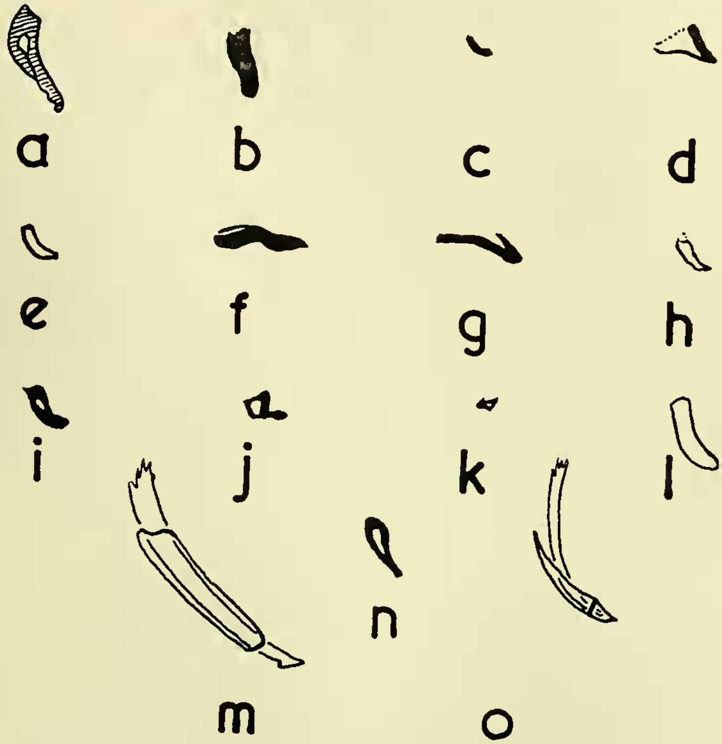


Fig. 32. Lateral views of the gubernacula of various species of *Eurystomina* (continued). Arranged as in fig. 31 with the ventral surface to the left except for " *m* " and " *o* " where the ventral surface is to the right. *a*—*E. opthalmophora* (= *E. ornatum* of Wieser, 1955) ; *b*—*E. terricolum* var. *opthalmophorum* (after Allgén, 1947) ; *c*—*E. spissidentata* (after Allgén, 1947) ; *d*—*E. trichophora* (after Allgén, 1959) ; *e*—*E. filicaudata* (after Allgén, 1959) ; *f*—*E. mirabilis* (after Allgén, 1959) ; *g*—*E. linstowi* (after Allgén, 1959) ; *h*—*E. stenolaima* (after Allgén, 1959, fig. 84*c*) ; *i*—*E. stenolaima* (after Allgén, 1959, fig. 84*b*) ; *j*—*E. fenestrella* (after Mawson, 1958) ; *k*—*E. norvegica* (after Allgén, 1947) ; *l*—*E. gerlachi* sp. nov. (after *E. assimile* of Gerlach, 1951) ; *m*—*Gerlachystomina sawayai* (after Gerlach, 1954*a*) ; *n*—*E. americana* (after *E. minutisculae* of Timm, 1954) ; *o*—*G. filispicula* (after Gerlach, 1954).

EURYSTOMINA Filipjev, 1921

Eurystoma Marion, 1870 ; *Eurystomina* Filipjev, 1921 ; *Marionella* Cobb, 1922 ; *Eurystomatina* Schuurmans Stekhoven, 1935 (invalid emendation).

Type species : *Eurystoma spectabile* Marion, 1870.

DISTRIBUTION. Cosmopolitan, as constituted here.

The genus *Eurystomina* is the type genus of the subfamily Eurystominae Filipjev, 1934 and differs from the other genera of the subfamily in the following characters:

> Oesophagus without posterior bulbs ; cephalic setae relatively short ; caudal glands present ; two well-developed, winged, pre-cloacal supplements on the male tail ; gubernaculum developed dorsally away from the spicules.

Two groups of species may be recognized within the genus, either on the presence or absence of eye spots or, another grouping, on whether the tail is short, stout and rounded posteriorly or is long and narrow posteriorly. It is not clear whether or not the two groups coincide since the pigment of the eye spots appears to be very easily removed during fixation or subsequent storage and in many cases where eye spots are not reported they may in fact have been overlooked because of this. As Wieser (1953*a*) points out " In this genus about 50% of the species are incompletely described which makes faultless classification and grouping nearly impossible ". As a result no attempt is made here to propose any groupings for the species referred to the genus except for the two species described by Gerlach (1954, 1954*a*) which are referred to a new genus (see p. 254).

Analysis of the Species of Eurystomina

1. **Eurystomina abyssalis** Micoletzky, 1930[1]

Eurystomina abyssale Micoletzky, 1930, pp. 291–293. Fig. 11.

LOCALITY. Kei Island, the Sunda Islands.

This species, which is known from females only, appears to be distinct and is characterized, particularly, by a rounded, relatively simple head. No ocelli are mentioned. This species may not, in fact, be referable to the genus *Eurystomina* as the head appears to be much simpler than that characteristic of the genus and I shall treat it as only provisionally a member of the genus.

2. **Eurystomina americana** Chitwood, 1936

Eurystomina americana Chitwood, 1936, pp. 212–213. Figs. 24–26 ; Chitwood & Timm, 1954, p. 315.
Eurystomina minutisculae of Timm, 1954, p. 15. Figs. 21–22, non Chitwood, 1951.
non *Eurystomina americana* of Chitwood, 1951, pp. 628–629. Figs. 3, A–C (= *Eurystomina chitwoodi* sp. nov.).

LOCALITIES. Shackleford's Banks, N.C., U.S.A. (type locality) ; Solomons Island, Md., U.S.A.

---

[1] The specific names used are as emended by Andrassy (1959).

This species is characterized by the shape of the gubernaculum which is relatively broad and rounded distally and then constricts evenly to a narrow proximal part (Text-fig. 31, *t*). Chitwood (1936) reports only one row of denticles in the buccal cavity and the absence of ocelli while Timm (1954), in describing his *E. minutisculae*, mentions three rows of denticles and ocelli. Nevertheless, I consider Timm's specimens to be, almost certainly, conspecific with *E. americana* of Chitwood (1936) since the form of the gubernaculum is almost identical in both descriptions, compare Chitwood's figure (fig. 31, *t*) with that of Timm (fig. 32, *n*). Certainly Timm's species is not conspecific with *E. minutisculae* as described by Chitwood (1951) nor is *E. americana* as described by Chitwood (1951) conspecific with the original specimens (see below, p. 244).

3. ***Eurystomina assimilis*** (de Man, 1876), *species dubia*

Oncholaimus assimilis de Man, 1876, p. 95, Pl. 7, figs. 5, *a–b*.
non *Eurystoma assimile* of Filipjev, 1918, pp. 157–161. Pl. 5, fig. 29 (= in part *E. ornatum* and *E. filiforme*).
non *Eurystomina assimilis* of Allgén, 1929*a*, p. 20 (*species dubia*) ; of Allgén, 1931, p. 230 (listed as *E. filiforme* on p. 213 ; *species dubia*) ; of Allgén, 1933, p. 36 (*species dubia*).
non *Eurystomina assimilis* of Filipjev, 1922, p. 568 (= in part *E. ornatum* and *E. filiforme*).
non *Eurystomina assimile* of Schuurmans Stekhoven, 1943, pp. 348–349. Figs. 19, A–C (= ? *E. gerlachi*, in part and *E. pettiti*, in part).
non *Eurystomina assimile* of Gerlach, 1951, pp. 199–200. Fig. 4, *a–c* (= *E. gerlachi* nom. nov.).

LOCALITY. Coast of Holland (type locality).

The original description of this species is based on a female only and, in spite of the good description given by de Man (1876) the redescriptions given by Filipjev (1918) and Gerlach (1951) clearly refer to different species. Filipjev in fact has confused two species, *E. ornata* and *E. filiformis*, as apparently has Schuurmans Stekhoven (1943). *E. assimilis* has also been treated as a synonym of *E. ornatum* by various authors (e.g. Micoletzky, 1924 ; Wieser, 1953 ; Allgén, 1959 ; among others) thus demonstrating the difficulties involved in attempting to identify the species de Man actually studied. As a result I propose that *E. assimilis* be treated as a *species dubia*. Allgén's records (1931 and 1933) are based on females and his 1929*a* record is, as are the others, without a description.

4. ***Eurystomina bilineata*** Wieser, 1953*a*, *species inquirenda*

Eurystomina bilineata Wieser, 1953*a*, pp. 138–139. Figs. 85, *a–b*.

LOCALITY. Islas Gueitecas, Archipiellago de los Chonos and Peninsula Taitao ; Canal Errazuriz " Islote Elena " (Faro Islote Diego).

This species is known from females only and Wieser apparently considers it to be distinct in having only six cephalic setae and one row of denticles with a sclerotized ring between the anterior and posterior chambers of the buccal cavity.

5. *Eurystomina californica* (Allgén, 1947), *species dubia*

Eurystomatina californicum Allgén, 1947, p. 129. Fig. 35 ; Allgén, 1959, p. 89.
Eurystomina californicum Wieser, 1953, p. 136 (doubtful species).

Localities. San Diego, California, U.S.A. (type locality) ; Falkland Islands.

The original description of the species is based on one juvenile specimen and the second record (Allgén, 1959) is based on a further juvenile which ". . . in the shape of its tooth and its tail seems to be identical with this species [*E. californica*] ". The description of this species is totally inadequate and I agree with Wieser (1953*a*) that it is " doubtful ". I propose to treat it as a *species dubia*.

6. *Eurystomina chilensis* nom. nov.

Eurystomina retrocellatum of Wieser, 1953*a*, p. 138. Figs. 84, *a–c*.
non *Eurystomina retrocellatum* Micoletzky, 1930, pp. 289–291. Fig. 10.

Locality. Many localities on the coast of Chile, see Wieser (1953*a*) for details.

This species is quite clearly different from all the others referred to the genus, except *E. retrocellata*, not only in having a rasp-like arrangement of many rows of small denticles in the buccal cavity but also in the shape of the gubernaculum (Text-fig. 31, *i*). It may in fact be conspecific with *E. retrocellata* of Micoletzky (1930) but without a detailed figure of the male genital apparatus of that species it is impossible to be sure. The presence of many rows of denticles may prove sufficient to warrant the introduction of a new genus at some later date.

7. *Eurystomina chitwoodi* nom. nov.

Eurystomina americana of Chitwood, 1951, pp. 628–629. Figs. 3, A–C ; non Chitwood, 1936.

Locality. Rockport Habor, Texas, U.S.A.

The redescription given by Chitwood (1951) of the species he originally described in 1936 clearly does not apply to the same species. It differs most markedly in the form of the gubernaculum which in the true *americana* (Text-fig. 31, *t*) is very narrow proximally while in the redescription it is broad along its whole length (Text-fig. 31, *k*). As the second description cannot be applied to any of the other named species within the genus I name it here as new.

8. *Eurystomina eurylaima* (Ditlevsen, 1930)

Marionella eurylaima Ditlevsen, 1930, pp. 225–227, 37–39.
Eurystomina eurylaima, Wieser, 1953*a*, p. 135.

Locality. Three Kings Island (♂) and Bay of Islands (♀), New Zealand.

The description of this species is based on one male and one female collected from different localities and I here select the locality from which the male was obtained as the type locality. No eye spots are mentioned and no cephalic setae were found. It is distinguishable by the form of the gubernaculum (Text-fig. 31, *e*), which is long, narrow and tapers to a rather fine, rounded point proximally.

9. *Eurystomina fenestrella* Wieser, 1953*a*

Eurystomina fenestrella Wieser, 1953*a*, p. 140. Figs. 87, *a–d*; Mawson, 1958, pp. 355–356. Figs. 41, *a–c*.

LOCALITIES. Various localities on the coast of Chile (see Wieser, 1953, for details) and Heard Island and Macquarie Island, Subantarctica.

This species is distinct and is characterized by the form of the gubernaculum which is squarish in outline and massive distally bearing a rather narrow, small proximal part (Text-fig. 31, *h*). The specific name is obtained from the very large and prominent fenestra which occurs in the distal part of the gubernaculum. As Mawson (1958) points out, the proximal part of the gubernaculum in her specimens is shorter than that figured by Wieser, it is also rather stouter (see Mawson's, 1958, fig. 416—redrawn here as Text-fig. 32, *j*), but it is possible that Mawson has been unable to see the extreme end of the proximal part of the gubernaculum which Wieser's figure shows to be very delicate (Text-fig. 31, *h*). Even if the difference shown by Mawson truly exists I would treat it as variation and accept that she studied the same species as that described by Wieser.

10. *Eurystomina filicaudata* (Allgén, 1959), *species dubia*

Eurystomatina filicaudatum Allgén, 1959, p. 92. Figs. 86, *a–b*.

LOCALITY. South Georgia, Antarctica.

See p. 213 for a discussion of all species described by Allgén (1959).

11. *Eurystomina filicolle* (Allgén, 1959), *species dubia*

Eurystomatina filicolle Allgén, 1959, pp. 92–93. Figs. 87, *a–b*.

LOCALITIES. Falkland Islands; South Georgia and Graham Land, Antarctica. See p. 213.

12. *Eurystomina filiformis* (de Man, 1888)

Eurystoma filiforme de Man, 1888, pp. 26–28. Pl. 3, figs. 13–13*d*; ? Ditlevsen, 1919, pp. 202–203.
Eurystoma assimile of Filipjev, 1918–21, pp. 157–161. Pl. 5, fig. 29, *f* (in part).
Eurystomina assimile of Filipjev, 1922, p. 568 (in part).
non *Eurystoma filiforme* of Steiner, 1916, p. 602. Pl. 16, fig. 24*a*; pl. 28, 24, *b* (*species dubia*).

LOCALITIES. North Sea, Black Sea.

Filipjev (1918) treats this species as a synonym of *E. assimilis* while Micoletzky (1924) and Wieser (1953*a*), although the latter author expresses some reservations, treat it as a synonym of *E. ornata*. Wieser argues that the original description of *E. ornata* is insufficient to allow any conclusions as to its independence from various nominal species to be drawn (see Wieser, 1953*a* : 136) but, as will be pointed out later (p. 250), the figure of the gubernaculum given by Eberth (1863) for *E. ornata* (redrawn as Text-fig. 31, *n*) is sufficient to allow the species to be identified and it is clear that *E. filiformis* is distinct from it (see Text-figs. 31, *l* and *a*). Further it is clear that Filipjev's (1921) figures of *E. assimilis* represent two species, *E. ornata* (fig. 29*c*—redrawn here as Text-fig. 31, *b*) and *E. filiformis* (fig. 29*f*—redrawn here as Text-fig. 31, *a*). Filipjev's figure 29*f* corresponds almost exactly with the original description given by de Man (1888, pl. 3, figs. 13*b* and 13*c*—13*c* redrawn here as Text-fig. 31, *l*) and I therefore treat *E. assimilis* of Filipjev, 1918 as partly *E. ornata* and partly *E. filiformis*.

E. filiformis is a good species which can be distinguished by the form of the gubernaculum with its evenly-rounded ball-like proximal end (Text-figs. 31, *a* and *l*) and, perhaps a less reliable character, by the relative distribution of the pre-cloacal supplements on the posterior end of the male which are closer together than the more posterior is close to the cloacal opening, in contradistinction to the condition in *E. ornata* in which the supplements are not so markedly bunched together.

13. ***Eurystomina filispicula*** Gerlach, 1954

= *Gerlachystomina filispiculum* (Gerlach, 1954) (see p. 255)

14. ***Eurystomina frøyense*** (Allgén, 1946), *species dubia*

Eurystomatina fryense Allgén, 1946, p. 161.
Eurystomina froyense Wieser, 1953*a*, p. 136 (doubtful species).

LOCALITY. Froya Island, Norway.

The status of this species, which is based on one juvenile specimen, is, as is pointed out by Wieser (1953), very doubtful. No figures have been published and I propose to treat it as a *species dubia*.

15. ***Eurystomina gerlachi*** nom. nov.

Eurystomina assimile of Gerlach, 1951, pp. 199–200. Figs. 1, *a–c*, non de Man, 1876.
? *Eurystomatina assimile* of Schuurmans Stekhoven, 1943, pp. 348–349. Fig. 19, B (in part).

LOCALITY. Varna, Bulgarian coast of the Black Sea.

As is pointed out above under *E. assimilis* de Man's description of that species is based on females and I treat it as a *species dubia*. The difficulties involved in identifying that species are exemplied by the fact that Filipjev (1918) confuses two species in giving his redescription and Gerlach (1951) describes yet a third species. Gerlach's species does, however, at least have the distinction of apparently being different from any other referred to the genus, with the possible exception of *E. assimilis* of Schuurmans Stekhoven (1943) in part, and is here named *E. gerlachi* sp. nov. The *Eurystomatina assimilis* of Schuurmans Stekhoven (1943) appears to have been based on a mixture of two species, *E. gerlachi* (fig. 19, B—redrawn here as Text-fig. 31, *q*) and *E. pettiti* (fig. 19, C—redrawn here as Text-fig. 31, *r*), although the figures given by Schuurmans Stekhoven are insufficient for certainty. It does, however, appear certain that his redescription is based on two species.

E. gerlachi may be distinguished by the relative simplicity of the gubernaculum which is about the same width along its whole length (Text-fig. 1, *l*). Schuurmans Stekhoven's figure (Text-fig. 31, *q*) suggests that the gubernaculum may be fenestrated although Gerlach figures it as entire.

16. **Eurystomina linstowi** (Allgén, 1959), *species dubia*

Eurystomatina linstowi Allgén, 1959, p. 94. Figs. 89, *a–c*.

Locality. Falkland Islands.
See p. 213.

17. **Eurystomina lithothamnii** (Saveljev, 1912), *species inquirenda*

Eurystoma lithothamnii Saveljev, 1912, pp. 117–118.
Eurystomina lithothamnii, Wieser, 1953*a*, p. 136.

Locality. Palafjord, Relictensee Mogilnoje.

This species is described by Saveljev (1912) without figures but it appears to be distinct in the distance separating the pre-cloacal supplements on the male tail. Its status is, nevertheless, open to question and I must treat it as a *species inquirenda*.

Filipjev (1918 : 157) lists *E. filiforme* of Steiner (1916) as a possible synonym of this species but Steiner's record is based on one moulting juvenile specimen and I treat it above as a *species dubia*.

18. **Eurystomina littoralis** Allgén, 1929, *species dubia*

Eurystomina littorale Allgén, 1929, pp. 13–14. Figs. 1, *a–b*.
Eurystomatina littorale Bresslau & Schuurmans Stekhoven in Schuurmans Stekhoven, 1935. p. V, b. 57. Figs. 149, A–B ; Bresslau & Schuurmans Stekhoven, 1940, p. 32. Pl. 7, figs, 32, A–B.

Locality. South coast of Sweden.

The original description of this species is based on one juvenile specimen and it is extremely doubtful whether it will ever be possible to refer it definitely to an adult worm. Bresslau & Schuurmans Stekhoven (1940) describe a single young female which they consider to be conspecific with that described by Allgén but this record must be considered to be of little value and I treat it also as that of a *species dubia*.

19. **Eurystomina minutisculae** Chitwood, 1951

Eurystomina minutisculae Chitwood, 1951, p. 629. Figs. 3, D–G. non *Eurystomina minutisculae* of Timm, 1954, p. 15. Figs. 21-22 (= *E. americana*).

Locality. Mud Island, Aransas Bay, Texas, U.S.A.

Chitwood chooses to contrast this species with *E. filiforme* from which it clearly differs not only in the measurements and ratios referred to by Chitwood but also in the highly characteristic form of the broad, massive, bluntly rounded gubernaculum (Text-fig. 31, *j*). This species can hardly in fact, be confused with any other species of the genus, the shape of the gubernaculum is so very characteristic. Timm (1954) redescribes what he considers to be this species but the outline of the gubernaculum as he figures it (Text-fig. 32, *n*) is so totally different from that figured by Chitwood that there is no doubt that Timm misidentified his specimens and they are considered above probably to represent specimens of *E. americana*.

Wieser (1953*a*) suggests that this species may be the same as *E. retrocellatum* but Chitwood specifically mentions three rows of minute denticles in the buccal cavity while *E. retrocellatum* is characterized by a very large number of denticles and the two species cannot be confused.

20. **Eurystomina mirabilis** (Allgén, 1959), *species dubia*

Eurystomatina mirabile Allgén, 1959, pp. 93–94. Figs. 88, *a–c*.

Localities. South Georgia and the Falkland Islands.

See p. 213. The accuracy of fig. 2, *f* is doubtful since Allgén (1959) refers to a "denticulated posterior edge" to the gubernaculum which is not shown in his figure.

21. **Eurystomina norvegica** (Allgén, 1947*a*), *species inquirenda*

Eurystomatina norvegicum Allgén, 1947*a*, pp. 54–55. Figs. 4, *a–b*.
Eurystomina norvegicum Wieser, 1953*a*, p. 135.

Locality. Storfosen Island, Norway.

The description of this species is insufficient to establish its systematic validity even although males were found and described. The figures which Allgén gives are much too small to be of any value (see Text-fig. 32, *h* which is the gubernaculum of this species redrawn from Allgén's figure).

22. **Eurystomina opthalmophora** (Steiner, 1922)

Eurystomina terricola var. *opthalmophorus* Steiner, 1922, pp. 215–217. Pl. 11, figs. 4, *a–d*.
? *Eurystomina ornatum* var. *indicum* Micoletzky, 1930, pp. 285–288. *Figs.* 9, *a–b*.
Eurystomina opthalmophorus, Wieser, 1953*a*, p. 136.
Eurystomina ornatum of Wieser, 1955, pp. 161–163. Fig. 1 ; of Chitwood, 1960, pp. 377–378. Pl. 4, figs. F–G.
non *Eurystominum terricolum* var. *opthalmophorum* of Allgén, 1947, p. 127. Figs. 33, *a–b* (= *species inquirenda*).

Localities. Port Arthur, Russia, Eastern Asia (type locality) ; (?) Shira-hamotyo, Wakayama-ken, Japan ; (?) many localities in the Sunda Islands (see Micoletzky for details (1930)) ; La Jolla and Dillon Beach, California, U.S.A.

Filipjev (1927), Micoletzky (1930) and Wieser (1953*a*) consider the variety described by Steiner (1922) to be a distinct species but later Wieser (1955) and Chitwood (1960) consider it indistinguishable from *E. ornata*. The species described by Wieser (1955) and by Chitwood (1960) is clearly not *E. ornata* as a comparison of Wieser's figure of the gubernaculum (see Text-fig. 32, *a*) with those of Eberth (Text-fig. 31, *n*) and Filipjev (Text-fig. 31, *b*) clearly demonstrates. On the other hand Wieser, after studying the Japanese specimens concludes that "The present specimens make it clear beyond all doubt that Steiner's *E. terricola* var. *opthalmophora* is also synonymous with *E. ornata* (compare the present figure with those of Steiner, 1922 and Filipjev, 1918)". Thus Wieser considers his specimens to be conspecific with those on which Steiner (1922) based his description of *E. opthalmophora* and I think this is very probably correct, but I cannot accept that *E. opthalmophora* is conspecific with either of the species on which Filipjev (1918) based his redescription of what he called *E. assimilis* (see above under *E. filiformis* and *E. ornata*). *E. opthalmophora* is, therefore, a good species which is distinguishable by the shape and structure of the gubernaculum. Chitwood (1960) stresses the similarity between his specimens and the description given by Wieser (1955) and it is clear that he also studied *E. opthalmophora*.

The status of *E. ornata* var. *indica* Micoletzky, 1930 is uncertain but it appears probable that it is also a synonym of *E. opthalmophora*. As Wieser (1955) points out the lack of wings to the pre-cloacal supplements may be of some systematic importance although it is already known that they may not be developed in some specimens. In fact, as in the case of *E. pettiti*, one of the supplements, at least, may completely fail to develop. Nevertheless the full synonymy of *E. o.* var. *indicum* and *E. opthalmophora* cannot be considered as wholly established and it is listed here as a doubtful synonym only.

Allgén's (1947) record of this species is almost certainly inaccurate since the structure of the gubernaculum appears to be totally different from that typical of *E. opthalmophora* (see Text-fig. 32, *b*—Allgén's (1947) figure redrawn). On the other hand it is not sufficient for Allgén's record to be referred to any other species and this record is, therefore, treated as that of a *species inquirenda*.

23. ***Eurystomina ornata*** (Eberth, 1863)

Enoplus ornatus Eberth, 1863, pp. 40–41. Pl. IV, figs. 13–15 ; pl. V, figs. 5–6.

Eurystoma ornatum, Filipjev, 1918, p. 156.

Eurystomatina ornatum, Micoletzky, 1924, pp. 248–251 (in part since Micoletzky lists as synonyms several species here treated as distinct).

Eurystoma assimile of Filipjev, 1918, pp. 157–161. Fig. 29*c* (in part).

non ***Oncholaimus ornatus***, Daday, 1901, pp. 442–444. Pl. xxii, figs. 1–3 (= *species dubia*).

non ***Eurystomina ornatum*** var. *indicum* Micoletzky, 1930, pp. 285–288. Figs. 9, *a–b* (= *E. opthalmophora*).

non ***Eurystomina ornatum*** of Gerlach, 1952, p. 519 (= *species dubia*) ; of Wieser, 1955, pp. 161–163. Fig. 1 (= *E. opthalmophora*) ; (?) of Luc & De Coninck, 1959, pp. 112–114. Figs. 14–15 ; of Chitwood, 1960, pp. 377–378.

non ***Eurystomatina ornatum*** of Allgén, 1957 (= *species dubia*). Pl. 4, figs. F–G (= *E. opthalmophora*).

non ***Eurystomina ornatum*** var. *indicum* of Timm, 1961, pp. 39–40. Figs. 16, *a–b* (= *species dubia*).

The following records of this species are not accepted since it is impossible to know whether they apply to this species or not since most of the authors giving the records treat *E. ornata* and *E. filiformis*, at least, as indistinguishable and with none of them is there a description adequate to establish to which species the record applies ; Villot, 1875 ; Southern, 1914 ; Allgén, 1940, 1943*a*, 1947, 1951 ; Schuurmans Stekhoven, 1950, pp. 74–76. Figs. 36, A–B. Although Schuurmans Stekhoven gives a description he only studied one female and his description is insufficient to allow the species he studied to be identified.

LOCALITIES. Mediterranean and Black Seas ; (?) Atlantic Ocean.

E. assimilis, *E. tenue* and *E. filiformis* have been treated as indistinguishable from this species at various times (e.g. Villot, 1875 ; Filipjev, 1918 ; Micoletzky, 1924 ;

Wieser, 1953—with some reservations; Allgén, 1959) but *E. assimilis* is based on females only and is treated above as a *species dubia* (see p. 243); *E. tenue* is probably a synonym of *E. spectabilis* (see p. 251) and *E. filiformis* is a distinct species which differs from *E. ornata* in the form of the gubernaculum (see p. 245). The synonymy of this species is very complicated since, although the species has been recorded on many occasions, many of the records are based on female or juvenile specimens and many of the authors accept the synonymity of *E. ornata* and *E. filiformis*. As explained above I feel that records based on female specimens only should be treated with the greatest reservation and, in this case, I will not accept records which are not accompanied by adequate illustrations. The dangers of doing so are exemplified by the record of *E. assimilis* of Filipjev (1918) in which he has in fact recorded *E. ornata* and *E. filiformis* as the same species (see discussion under *E. filiformis*).

E. ornata is characterized by a gubernaculum which is massive and squarish in outline distally while it constricts fairly sharply about half-way along its length so that the proximal half of its length is narrow and even in width, except for the extreme proximal end which is swollen into two rounded knobs (see Text-figs. 31, *b* and *n*).

The gubernaculum of *E. ornata* var. *indica* is totally different from this, as is the gubernaculum of *E. ornata* of Wieser (1955) and of Chitwood (1960). These records are considered to represent *E. opthalmophora* (see immediately above). *E. ornatum* var. *indicum* of Timm, 1961, is based on females only and is treated as the record of a *species dubia*.

The status of *E. ornata* of Luc & De Coninck (1959) is doubtful since the male genital apparatus is not figured.

24. **Eurystomina paralittorale** Timm, 1951, *species dubia*

Eurystomina parallittorale Timm, 1951, pp. 15–16. Figs. 19–20.

LOCALITIES. Plum Point and Chesapeake Beach, Maryland, U.S.A.

This species is based on one (?) juvenile worm and it is impossible to come to any decision as to its validity or relationships. I, therefore, propose to treat it as a *species dubia*.

25. **Eurystomina pettiti** sp. nov.

See above, p. 234.

26. **Eurystomina propinqua** (Allgén, 1947), *species dubia*

Eurystomatina propinquum Allgén, 1947, pp. 129–130. Figs. 36, *a–b*; Allgén, 1959, p. 89.

LOCALITIES. San Diego, West Coast of the U.S.A. (type locality); Falkland Islands, Port Louis and Greenpatch, Antarctica.

The original description of this species is based on one juvenile specimen which was clearly in a very poor state of preservation. Allgén in fact states on p. 66 of his paper that all the specimens were, in general, poorly preserved. The second record (Allgén, 1959) is based on two female specimens, and in the same report Allgén rejects Wieser's (1953*a*) treatment of *E. californica* and *E. propinqua* as doubtful species. I, however, agree wholly with Wieser and must insist that the poor description of badly-preserved female or juvenile specimens as new species must inevitably lead to their rejection as *species dubiae*, as I do with *E. propinqua*.

27. ***Eurystomina repanda*** Wieser, 1959

Eurystomina repanda Wieser, 1959, p. 30. Pl. XII, figs. 27, *a–b*.

LOCALITIES. Vashon Island and Alki Point, Puget Sound, U.S.A.

This species is characterized by a simple, relatively stout gubernaculum (Text-fig. 31, *m*) and a buccal cavity bearing two rows of rods, two (or one and a half) rows of dots and a cuticular ring.

No eye spots were seen.

28. ***Eurystomina retrocellata*** Micoletzky, 1930, *species incertae sedis*

Eurystomina retrocellatum Micoletzky, 1930, pp. 289–291. Fig. 10.
non *Eurystomina retrocellatum* of Wieser, 1953*a*, p. 138. Figs. 84, *a–e* (= *E. chilensis* sp. nov.).
non *Eurystomina retrocellata* of Gerlach, 1954*b*, p. 55 (= *species dubia*); non Andrassy, 1959, pp. 247–248 (= *species dubia*).

LOCALITY. Kei Island, Sunda Islands.

This species is characterized by the presence of large numbers of teeth in the buccal cavity. Wieser (1953) suggests that it may be indistinguishable from *E. minutisculae* although Chitwood (1951) specifically refers to "... two transverse bands, the posterior bearing three very minute rows of denticles", as occurring in his species. In spite of Micoletzky's description this species must be considered *incertae sedis*, at least, since no figures of the male are given and there is no description of the form of the gubernaculum—only its length relative to the spicules is given.

Gerlach (1954*b*) studied only one specimen, later lost, and, because of the great difference in geographical locality as well as because of the characters on which he bases his identification, I treat his record as that of a *species dubia*. Andrassy's (1959) record, based on one female and four juveniles, is dismissed as a *species dubia* for the same reasons.

29. ***Eurystomina sawayai*** Gerlach, 1954*a*

= *Gerlachystomina sawayai* (Gerlach, 1954*a*) (see p. 255).

30. ***Eurystomina spectabilis*** (Marion, 1870)

Eurystoma spectabile Marion, 1870, pp. 20–21. Pl. 20, figs. 1–1*b*; Filipjev, 1918, p. 157.
Eurystoma tenue Marion, 1870, p. 21. Pl. 20, figs. 2–2*b*; Filipjev, 1918, p. 156 (suggested synonym of *E. ornatum*).
Marionella spectabilis, Cobb, 1922, p. 509.
Eurystomina spectabilis, Baylis & Daubney, 1926, p. 115.

LOCALITY. Marseille, Mediterranean.

Filipjev (1918) and Micoletzky (1924) consider *E. tenue* to be indistinguishable from *E. ornata* while Filipjev considers *E. spectabilis*, which is the type species of the genus, to be a distinct species because of the very large pre-cloacal supplements figured by Marion on the male tail. *E. spectabilis*—accepting Marion's figure to be reasonably accurate—is apparently distinguishable from *E. ornatum*, and all the other species in the genus, in having a gubernaculum which is relatively long and narrow, with sharply pointed proximal end (Text-fig. 31, *p*). *E. tenue* has exactly the same form of gubernaculum (Text-fig. 31, *c*) and as I can find no other characters which will separate the two forms I consider *E. tenue* to be a synonym of *E. spectabilis*. It is fairly certain, in my opinion, that the apparently large size of the pre-cloacal supplements in both forms (because they are shown as large in both figures although Filipjev only comments on this with reference to *E. spectabilis*) may be attributed to artistic licence.

31. ***Eurystomina spissidentata*** (Allgén, 1947), *species inquirenda*

Eurystomatina spissidentatum Allgén, 1947, pp. 127–128. Figs. 38, *a–b*.
Eurystomina spissidentatum, Wieser, 1953*a*, p. 136 (doubtful species).

Localities. Perias Islands Bay of Panama and La. Jolla, California.

It is impossible to establish the validity or relationships of this species on the basis of the description given by Allgén (1947) who refers to the gubernaculum as being finely dentate on the anterior side of the dorsal half but figures it as a simple, curved mass (fig. 2, *c*). I agree with Wieser (1953*a*) that it is a " doubtful species ".

32. ***Eurystomina stenolaima*** (Ditlevsen, 1930)

Marionella stenolaima Ditlevsen, 1930, pp. 227–230. Figs. 42–46.
non *Eurystomatina stenolaima* of Schuurmans Stekhoven, 1950, p. 77. Fig. 37 (= *E. stenolaimoides* Wieser, 1953*a*).
non *Eurystomatina stenolaimum* of Allgén, 1951, p. 382 (= *species dubia*).
non *Eurystomatina stenolaima* of Wieser, 1953*a*, pp. 138–140. Figs. 86, *a–c* (= *E. wieseri* sp. nov.).
non *Eurystomatina stenolaimum* of Allgén, 1959, pp. 88–89. Figs. 84, *a–c* (= *species dubia*).

Locality. Cape Brett, New Zealand.

This species is easily recognized by the highly characteristic gubernaculum (Text-fig. 31, *f*) which is massive distally and carries a narrow, slightly serrated process with a hooked end proximally. No eye spots are present according to Ditlevsen.

Wieser (1953*a*) describes what he considers to be this species but also points out that his "... specimens show several differences from Ditlevsen's type ; some of them, as especially the structure of the buccal cavity and the number of cephalic setae are most probably due to deficiencies in the original description ; ..." (Wieser, 1953*a* : 139). Wieser is probably correct in this since Ditlevsen specifically says that his specimens were in a poor condition. Nevertheless the form of the gubernaculum (Text-fig. 31, *f*) is so characteristic and so different from that figured by Wieser (Text-fig. 31, *g*) that I have no hesitation in treating Wieser's specimens as representing a new species (see *E. wieseri*).

The record of Allgén (1951) is without figures and I am not prepared to accept it as referring to this species. The same author later (Allgén, 1959) records this species again but points out that his specimens were intermediate in form between *E. stenolaima* and *E. eurylaima* but, although he describes the gubernaculum as being hooked like that in *E. stenolaima*, his figures in no way resemble the gubernaculum figured by Ditlevsen (see Text-figs. 32, *h* and *i*). For that matter his two figures do not correspond with each other and I will treat this record as representing a *species dubia*.

33. ***Eurystomina stenolaimoides*** Wieser, 1953*a*, *species dubia*

Eurystomatina stenolaima Schuurmans Stekhoven, 1950, p. 77. Fig. 37, non Ditlevsen, 1930.
Eurystomina stenolaimoides Wieser, 1953*a*, p. 135 nom. nov. pro *E. stenolaima* Schuurmans Stekhoven, 1950, pre-occupied by *E. stenolaima* Ditlevsen, 1930.

LOCALITY. Baie de Lilong, Villefranche, France.

Schuurmans Stekhoven (1950) describes a new species *E. stenolaima* from Villefranche. The specific name is pre-occupied by *stenolaima* Ditlevsen, 1930 so Wieser (1953*a*) proposes the name *stenolaimoides*. The description is based on one broken, incomplete specimen and its sex is not given. Wieser considers that it may be in fact referable to the genus *Symplocostomella* but I feel that this is unnecessary speculation and that this nominal species based on the pathetic remnants of a specimen should be decently interred as a *species dubia*.

34. ***Eurystomina tenuicaudata*** Allgén, 1931*a*

Eurystomina tenuicaudata Allgén, 1931*a*, pp. 120–122. Figs. 15, *a–c*.

LOCALITY. Campbell Island, South Pacific.

This long-tailed species is characterized by a relatively straight, slim gubernaculum which is swollen at both the proximal and the distal ends (Text-fig. 31, *s*).

35. ***Eurystomina tenuissima*** Filipjev, 1927, *species incertae sedis*

Eurystomina tenuissima Filipjev, 1927, pp. 179–180. Pl. 6, figs. 61, *a–b*.

LOCALITY. Port Catherine, Mourman.

This long-tailed species, of which only the female is known, does not appear to belong to the genus *Eurystomina* in view of the structure of the head with its massive buccal cavity. The establishment of its systematic position must await the discovery of more specimens. No eye spots are reported.

36. ***Eurystomina terricola*** (de Man, 1907), *species dubia*

Eurystoma terricola de Man, 1907, pp. 84–86. Pl. IV, figs. 17–17*a*.
Eurystomatina terricola, Schuurmans Stekhoven, 1935, p. V, b. 57. Figs. 147, A–B.
Eurystomina terricola, Filipjev, 1927, p. 179.
non *Eurystomatina terricola* ? Allgén, 1931*a*, pp. 119–120. Figs. 14, *a–b* (*species dubia*).
non *Eurystomina terricola* of Gerlach, 1954*a*, p. 55 (= *species inquirenda*).

LOCALITY. Island of Walcheren in soil soaked with brackish water.

De Man (1907) bases his description of this species on a female specimen, and although the description is good and the figure of the head excellent it is doubtful if it could ever be possible to recognize the species again. The doubtful record of Allgén (1931*a*) is based on two juvenile specimens from the South Pacific and it is extremely unlikely that they represent the same species as that studied by de Man and I dismiss the record as valueless.

37. ***Eurystomina trichophora*** (Allgén, 1959), *species dubia*

Eurystomatina trichophorum Allgén, 1959, pp. 90–92. Figs. 85, *a–b*.
Eurystomatina pilosum Allgén, 1959, p. 90. Caption to figs. 85, *a–b* (*lapsus*).

LOCALITIES. Fuegian Archipelago and South Georgia.

See p. 213. As is pointed out above the specimens reported on by Allgén (1959) were in an extremely poor condition and the descriptions of *E. trichophora* and *E. linstowi* support this argument. Thus, for example, no " V " value is given for the female of *E. trichophora* and the " Dimensions " given on p. 90 (Allgén, 1959) are not referred to either sex. Allgén refers to this species as *Eurystomatina pilosum* in the caption to the figures. This is clearly a *lapsus*.

38. ***Eurystomina trichura*** (Allgén, 1953), *species dubia*

Eurystomatina trichurum Allgén, 1953, pp. 91–92. Figs. 5, *a–b*.

LOCALITY. Gallmarfjord, west coast of Sweden.

This long-tailed species is based on one female specimen and its systematic position or validity cannot be established.

39. ***Eurystomina wieseri*** nom. nov.

Eurystomina stenolaima of Wieser, 1953*a*, pp. 139–140. Figs. 86, *a–c*, non Ditlevsen, 1930.

LOCALITIES. Islas Gueitecas, Archipielago de los Chonos and Peninsula Taitao ; Canal Moreleda, Puerto Lagunas. Chile.

The species, described by Wieser (1953*a*) as *Eurystomina stenolaima* differs from that species as described by Ditlevsen (1930) not only in the various points mentioned by Wieser (see above, *E. stenolaima*) but also in the form of the gubernaculum (Text-fig. 31, *g*) which should be compared with the gubernaculum figured by Ditlevsen (Text-fig. 31, *f*). I, therefore, consider Wieser's specimens to represent a distinct species, previously undescribed, for which I propose the name *E. wieseri* sp. nov.

GERLACHYSTOMINA gen. nov.

Eurystominae : oesophagus without posterior bulbs ; cephalic setae not extremely long ; pre-cloacal supplements rather simple in structure without massive anterior and posterior apophyses as in *Eurystomina* ; gubernaculum simple without an apophysis.

Type species : *Eurystomina filispiculum* Gerlach, 1954.

Other species : *Gerlachystomina sawayai* (Gerlach, 1954*a*) comb. nov.

GEOGRAPHICAL DISTRIBUTION. Mediterranean and coast of Brazil at Santos.

Gerlach (1954 and 1954*a*) describes two species which, although he refers them to the genus *Eurystomina*, differ markedly from all the other species referred to that genus in the form of the gubernaculum which, typically, bears a very distinct dorsal prominence, while in Gerlach's species this is lacking and the gubernaculum lies very close to the spicules (Text-figs. 32, *m* and *o*). In addition both species are characterized by pre-cloacal supplements which are much simpler than is typical of *Eurystomina* species. These characters must clearly exclude both species from the genus *Eurystomina* since it, as present constituted, forms a fairly homogenous group so far as the form of the male copulatory apparatus (spicules, gubernaculum and pre-cloacal supplements) is concerned. Gerlach's species appear to show some resemblances to *Thoonchus ferox* Cobb, 1920, the type and only species in that genus, but appears to differ from it in the form of the pre-cloacal supplements. This difference may not in fact exist and Gerlach's species may be congeneric with that of Cobb but it is not possible to establish this on the basis of Cobb's description and I, therefore, propose to erect a new genus, *Gerlachystomina*, for both of Gerlach's species. This has been anticipated above where a diagnosis of the new genus is given. The two species which are referred to it are :

1. ***Gerlachystomina filispicula*** (Gerlach, 1954)

Eurystomina filispiculum Gerlach, 1954, pp. 97–99. Figs. 1, *a–c*.

LOCALITY. Agay, Mediterranean coast of France.

This species differs from *G. sawayai* in the form of the gubernaculum (Text-fig. 2, *o*), the extremely long spicules and in the presence of only two or three rows of denticles in the buccal cavity.

2. ***Gerlachystomina sawayai*** (Gerlach, 1954*a*)

Eurystomina sawayai Gerlach, 1954*a*, p. 15. Figs. 9, *a–d*.

LOCALITY. Santos, Brazil.

This species differs from *G. filispicula* in the form of the gubernaculum (Text-fig. 32, *m*), the short, stout spicules with slightly barbed posterior ends and in the presence of many rows of denticles in the buccal cavity.

Summary of Changes Proposed

The changes proposed are complicated and may be summarized thus :

New Species

E. chilensis = *E. retrocellatum* of Wieser, 1953*a* non Micoletzky, 1930.
E. chitwoodi = *E. americana* of Chitwood, 1951 non Chitwood, 1936.
E. gerlachi = *E. assimilis* of Gerlach, 1951 and (?) of Schuurmans Stekhoven, 1943 (in part), non de Man, 1876.

E. pettiti = new species and (?) *E. assimilis* of Schuurmans Stekhoven, 1943 (in part).

E. wieseri = *E. stenolaima* of Wieser, 1953*a* non Ditlevsen, 1930.

New Genus

Gerlachystomina, with *G. filispicula* (Gerlach, 1954)—type species—and *G. sawayai* (Gerlach, 1954*a*).

Valid Species

E. abyssalis Micoletzky, 1930 ; *E. americana* Chitwood, 1936 ; *E. eurylaima* (Ditlevsen, 1930) ; *E. fenestrella* Wieser, 1953*a* ; *E. filiformis* (de Man, 1888) ; *E. minutisculae* Chitwood, 1951 ; *E. ornata* (Eberth, 1863) ; *E. opthalmophora* Steiner, 1922 ; *E. repanda* Wieser, 1959 ; *E. spectabile* (Marion, 1870) ; *E. stenolaima* (Ditlevsen, 1930) ; *E. tenuicaudata* Allgén, 1931*a*.

Species Dubiae

E. assimilis (de Man, 1878) ; *E. californica* (Allgén, 1947) ; *E. filicaudata* (Allgén, 1959) ; *E. filicolle* (Allgén, 1959) ; *E. froyense* (Allgén, 1946) ; *E. linstowi* (Allgén, 1959) ; *E. littoralé* Allgén, 1929 ; *E. mirabile* (Allgén, 1959) ; *E. paralittorale* Timm, 1951 ; *E. propinqua* (Allgén, 1947) ; *E. stenolaimoides* Wieser, 1953*a* ; *E. terricola* (de Man, 1907) ; *E. trichophora* (Allgén, 1959) ; *E. trichura* (Allgén, 1953).

Species Inquirendae

E. bilineata Wieser, 1953*a* ; *E. lithothamnii* (Saveljev, 1912) ; *E. norvegica* (Allgén, 1947*a*) ; *E. spissidentata* (Allgén, 1947).

Species Incertae Sedis

E. retrocellatum Micoletzky, 1930 ; *E. tenuissima* Filipjev, 1927.

Species Referred to the Synonymy of Other Species

E. tenue Marion, 1870 = *E. spectabile* ; *E. minutisculae* of Timm, 1954 = *E. americana* ; *E. americana* of Chitwood, 1951 = *E. chitwoodi* nom. nov. ; *E. assimile* of Gerlach, 1951 = *E. gerlachi* nom. nov. ; *E. assimile* of Filipjev, 1918 = *E. filiformis* (in part) and *E. ornata* (in part) ; *E. assimile* of Schuurmans Stekhoven, 1943 = (?) *E. gerlachi* (in part) and (?) *E. pettiti* (in part) ; *E. ornatum* var. *indicum* Micoletzky, and of Chitwood, 1960 = (?) *E. opthalmophora* ; *E. ornatum* of Wieser, 1955 = *E. opthalmophora* ; *E. retrocellatum* of Wieser, 1953*a* = *E. chilensis* nom. nov. ; *E. stenolaima* of Wieser, 1953*a* = *E. wieseri* nom. nov.

Chromadorina demani sp. nov.

Material Studied

6 ♂, 6 ♀, 3 larvae. B.M. (N.H.), Reg. Nos. 1961.315–331. Holotype ♂, 1961.331.

	Ratios				
	a	*b*	*c*	V	Body length
Males . . .	21·8	5·80	7·5	—	0·63
	21·6	6·28	7·3	—	0·69
	21·2	6·13	7·4	—	0·70
Females . .	18·1	4·5	8·7	55·1	0·58 (? late 4th stage stage larva)
	17·7	6·8	6·8	50·8	0·67
	19·9	6·3	7·2	51·4	0·72

Measurements (*in mm. ; in order of body lengths above*)

Males. Body breadth : 0·029 ; 0·032 ; 0·033. Oesophagus length : 0·108 ; 0·110 ; 0·114. Diameter of head : 0·011 ; 0·009 ; 0·012. Lengths of cephalic setae : 0·005 ; 0·006 ; 0·006. Length of oesophageal bulb : 0·026 ; 0·028 ; 0·029. Breadth of oesophageal bulb : 0·022 ; 0·022 ; 0·024. Nerve ring from the anterior end : 0·072 ; 0·064 ; 0·068. Excretory pore not seen. Length of spicules : 0·028 ; 0·032 ; 0·034. Length of gubernaculum : 0·027 ; 0·028 ; 0·028. Tail length : 0·084 ; 0·094 ; 0·097. Cloacal diameter : 0·027 ; 0·028 ; 0·031.

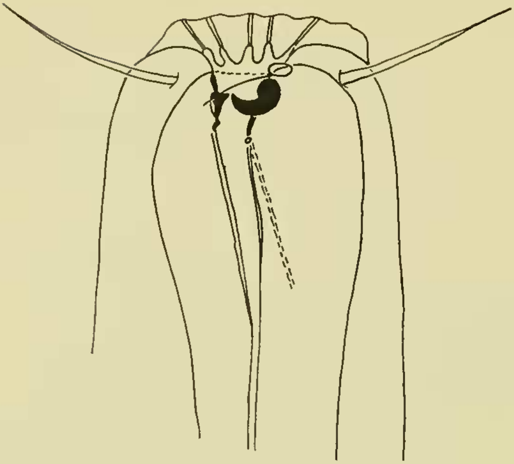
Females. Body breadth : 0·032 ; 0·038 ; 0·036. Oesophagus length : 0·133 ; 0·120 ; 0·170. Diameter of head : 0·018 ; 0·012 ; 0·016. Lengths of cephalic setae : 0·006 ; 0·007 ; 0·006. Length of oesophageal bulb : 0·024 ; 0·032 ; 0·033. Breadth of oesophageal bulb : 0·019 ; 0·021 ; 0·023. Nerve ring from the anterior end : 0·064 ; 0·064 ; 0·066. Excretory pore not seen. Tail length : 0·067 ; 0·099 ; 0·10. Anal diameter : 0·024 ; 0·021 ; 0·027. Distance of vulva from the anterior end : 0·32 ; 0·34 ; 0·37. Size of eggs : 0·051 × 0·025.

Cuticle

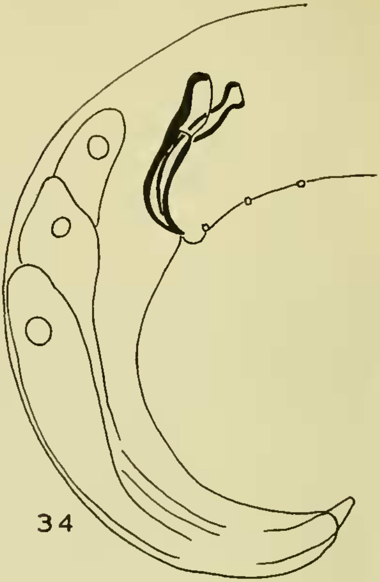
The cuticle is marked by rows of small punctations which appear to be restricted to the lateral field. Anteriorly these markings take the form of small dots (Text-fig. 38, *a*) which become progressively longer posteriorly until they are elongate, narrow strips (Text-fig. 38, *a* and *b*) and on the tail they are elongate oblongs (Text-fig. 38, *d*).

The Head and Oesophagus

The head appears to be relatively simple with four setae and, probably, two circles of six papillae each. The mouth opening is bounded by the usual twelve rugae and there are three solid cuticular teeth at the anterior end of the oesophagus (Text-fig. 33). There is a dorso-lateral sense organ present which is generally described as the amphid and is usually described as being spiral in this genus. I am unable to establish this in the present species and the possibility that this is in fact an amphidule (see above, p. 215) must remain. The oesophagus has a distinct posterior bulb with two conspicuous plasmatic interruptions (Text-fig. 39). No eye spots have been

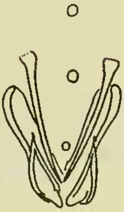


33

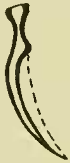


34

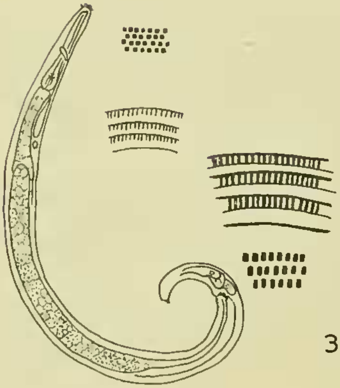
35



36

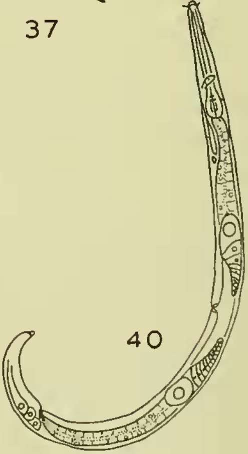


37



38

39



40

seen but any pigment which may have been present has almost certainly been washed out since, although the eye spots could be seen in some of the other species considered in this report, in very few cases was pigment present.

Tail

The tail is relatively long and narrow with a prominent spinerette. The caudal glands are located at the level of or posterior to the cloacal or anal openings (Text-figs. 34, 38 and 40).

Male

The spicules are equal in length and identical in structure, sickle-shaped, with relatively stout anterior ends followed by a constriction from which they evenly expand again and then taper evenly to fine sharp posterior ends (Text-figs. 34, 35 and 37). There may be alae but I cannot be sure (see Text-fig. 35). The spicules show some variation in their outline, the most usual shape being as in Text-fig. 35, but there is a tendency for the anterior swelling to be more pronounced. The most extreme example of this is shown in Text-fig. 37. The gubernaculum consists of at least two lateral pieces of which the distal ends are strongly cuticularized and appear at first glance to represent pieces distinct from the rest of the gubernaculum (Text-fig. 34). When viewed from the ventral aspect their greater cuticularization is clearly seen (Text-fig. 36) and the effect is due to the more proximal parts of the gubernaculum being very much less strongly cuticularized ventrally than is the case with the distal parts. I am unable to establish the presence of a median piece to the gubernaculum. There are three small median, ventral supplements anterior to the cloacal opening (Text-figs. 34 and 36) and there is a single testis (Text-fig. 38).

Female

The reproductive system consists of two opposed uteri with associated opposed, reflexed ovaries without obvious oviducts. The vulva opens almost exactly at the middle point of the body length (Text-fig. 40).

Discussion

This species is very similar to what Daday (1901), Micoletzky (1924) and Wieser (1954*b*) call *Chromadora* or *Chromadorina laeta* (de Man, 1876) and keys out to this species in Wieser's (1954*b*) key. Micoletzky (1924) considers *Chromadorina obtusa* Filipjev, 1918, the type species of *Chromadorina*, to be indistinguishable from *Chromadora laeta* so that *C. laeta* becomes the name of the type species. However, de Man's figures and description of *C. laeta* leave much to be desired ; the figure of the male tail showing the gubernaculum and (?) the spicules is particularly poor.

FIGS. 33–40. *Chromadorina demani* sp. nov. Fig. 33. Lateral view of head with the dorsal surface to the right. Fig. 34. Male tail from the lateral aspect. Fig. 35. Typical spicules from the right. Fig. 36. Ventral view of spicules and gubernaculum showing the three pre-coacal supplements. Fig. 37. An extreme variant of the spicule form, from the right. Fig. 38. Entire male from the right. *a*, *b*, *c*, *d*—detail of cuticular structure: *a*—just posterior to the head ; *b*—just posterior to the posterior end of the oesophagus ; *c*—about the middle of the body ; *d*—on the tail. Fig. 39. Lateral view of the oesophagus. Fig. 40. Entire female from the left.

In fact, I cannot accept that if there should be, as I believe there are, at least two very similar species that either could possibly be referred to *C. laeta* on the basis of the description given by de Man. I therefore propose that *Chromadora laeta* de Man, 1876, be treated as a *species dubia*. This action leaves *Chromadorina obtusa* as the name for the species described by Filipjev, a species which Micoletzky (1924) believed he had found, and redescribed as a synonym of *C. laeta*. However, the shape of the spicules and the gubernaculum in Micoletzky's figure of the male tail does not correspond with that shown by Filipjev and I cannot accept that the species described by the former author is the same as that studied by the latter. *C. obtusa* is, according to Filipjev's figure, characterized by spicules which are roughly the same width along their entire lengths and which end posteriorly in rather massive points while in *C. laeta* of Micoletzky the spicules narrow evenly along their lengths and end posteriorly in sharp, fine points. In addition, the shape of the gubernaculum, viewed from the lateral aspect, is totally different. In *C. obtusa* it is roughly the same width all along its length and is composed of one distinct plate while in *C. laeta* of Micoletzky it is drawn as very much thinner proximally than it is distally. Both these figures could be inaccurate (that of Micoletzky almost certainly is, since I suspect that he has failed to see the poorly cuticularized ventral sheet which is developed on the proximal end of the gubernaculum in *C. demani*) but the differences in the shape of the spicules appear to be valid.

C. demani differs from both these species, particularly, in the shape of the spicules in which the swelling near the proximal end is very characteristic and also, although this may be less reliable, in the shape of the gubernaculum. This means that the species reported and described by Micoletzky (1924) is left without a name and I propose for it the name *C. micoletzkyi* nom. nov. pro *Chromadorina laeta* of Micoletzky, 1924. *C. laeta* of Daday (1901) is very similar to *C. demani* at least in the form of the spicules but the spicule is shown to be relatively wide distally. The gubernaculum, however, as figured is totally different in outline from that in *C. demani* but, in view of the poor description, I propose that *C. laeta* of Daday, 1901, be treated as a *species dubia*. *C. laeta* of Wieser, 1954*b*, is also generally like the species considered here but the form of the gubernaculum, as figured, is totally different from that shown for all the other records and I propose to treat *C. laeta* of Wieser, 1954*b*, as a *species inquirenda*.

Euchromadora gaulica sp. nov.

Material Studied

3 ♂, 5 ♀, B.M. (N.H.), Reg. Nos. 1961.227–236. Holotype ♂, 1961.235.

	Ratios				
	a	*b*	*c*	V	Body length
Males	26·5	6·4	8·8	—	1·67
	32·9	6·6	8·7	—	1·58
	26·1	5·3	8·5	—	1·33
Females	36·6	6·0	9·4	51·2	2·34
	35·8	5·9	9·2	49·2	2·50
	40·0	6·4	11·6	48·9	2·80

Measurements (in mm. ; in order of body lengths)

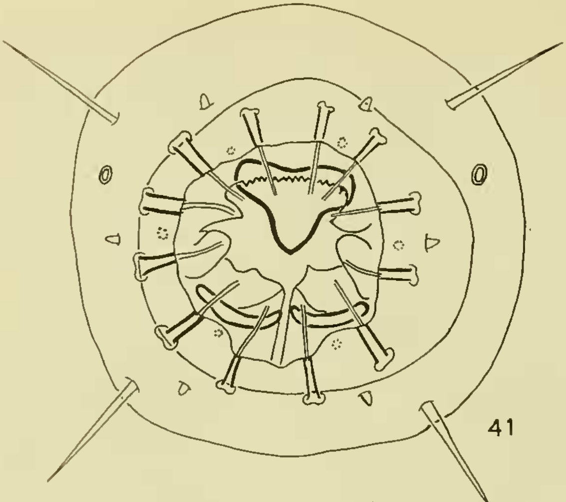
MALES. Body breadth : 0·063 ; 0·048 ; 0·051. Oesophagus length : 0·26 ; 0·24 ; 0·25. Diameter of head : 0·021 ; 0·028 ; 0·025. Nerve ring from anterior end : . . . ; 0·110 ; 0·098. Excretory pore not seen. Tail length : 0·19 ; 0·18 ; 0·15. Cloacal diameter : 0·038 ; 0·034 ; 0·040. Length of spicules : 0·048 ; 0·053 ; 0·058. Length of gubernaculum : 0·031 ; 0·035 ; 0·032. Length of gubernaculum as a percentage of the length of the spicules : 67 ; 66 ; 67. Width of lateral fields at mid-point of body : 0·039 ; 0·036 ; 0·037. The striations on the 1·33 mm. long specimen are 0·003 mm. apart immediately posterior to the head, 0·004 mm. apart at the mid-point of the body length and 0·003 mm. apart at the cloaca.

FEMALES. Body breadth : 0·064 ; 0·067 ; 0·070. Oesophagus length : 0·39 ; 0·41 ; 0·44. Diameter of head : 0·032 ; 0·034 ; 0·035. Nerve ring not seen. Excretory pore not seen. Tail length : 0·25 ; 0·26 ; 0·24. Anal diameter : 0·055 ; 0·052 ; 0·055. Vulva from anterior end : 1·20 ; 1·18 ; 1·37. Width of lateral fields at the mid-point of body : 0·054 ; 0·056 ; 0·057. The striations on the 2·34 mm. specimen are 0·003 mm. apart immediately posterior to the head, 0·004 mm. apart at the level of the posterior end of the oesophagus, 0·005 mm. apart at the level of the vulva and 0·004 mm. apart at the level of the anus. The greatest number of eggs present in one specimen is twenty-three.

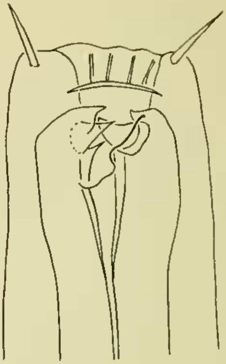
Cuticle

The structure of the cuticle in the genus *Euchromadora* has been discussed at some length by de Man (1886) and by Steiner & Hoeppli (1926). It is highly modified with a complex series of blocks and rods which vary from one part of the body to another in shape and distribution. Anteriorly the markings in *E. gaulica* are large hexagonal blocks separated by striations (Text-fig. 44) which show a distinct double effect so that more than one layer appears to be present when the cuticle is studied in optical section. In addition the blocks appear to be linked together by a network of narrow markings. More posteriorly the markings become more elongate and, about the level of the posterior end of the oesophagus become restricted to the lateral, dorsal and ventral surfaces only. The zones of markings dorsally and ventrally become increasingly narrow until they disappear completely about one-third along the body (see also de Man, 1886). The zone of markings laterally continues along the entire length of the body. The markings are continuous around the body at the posterior end as they are anteriorly.

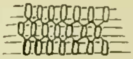
In addition to the block-like markings there are what I propose to call " Lateral Plates " which occur on the lateral sides of the body from about the posterior end of the oesophagus posteriorly. These plates, which lie deep within the cuticle, are straight on their posterior edges and convex on their anterior edges, along the anterior half of the body. They lie one between each pair of cuticular striations and correspond to each row of large block-like cuticular markings (Text-figs. 46 and 47). (The double markings shown represent an attempt to demonstrate the appearance produced by the two layers of cuticular block-like markings.) They



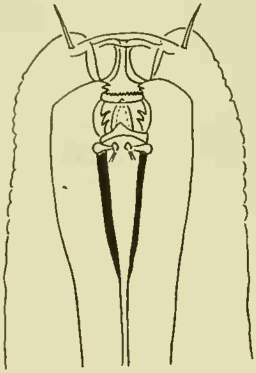
41



42

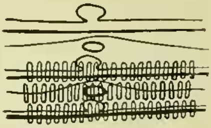


44

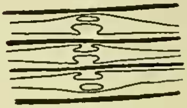


43

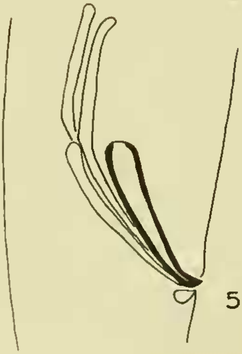
45



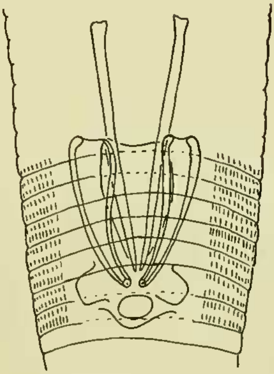
46



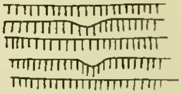
47



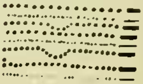
50



51



48



49

are pierced by a small, oval hole anteriorly and posteriorly they bear a similar opening which is, however, incomplete along its posterior edge (Text-fig. 47). On the posterior half of the body the conditions are reversed (Text-fig. 47). That is, the convex edge of the lateral plate is directed posteriorly and the straight edge is directed anteriorly. The change from one form of lateral plate to the other occurs almost exactly at the mid-point of the body length where one lateral plate is convex on both edges, carries two open holes and has no completely enclosed holes (Text-fig. 47). In the females this change occurs almost exactly opposite the vulvar opening.

Head and Oesophagus

The head is very blunt and bears four longish setae and six sessile papillae. There may be an inner circle of six smaller sessile papillae but I cannot be certain of their occurrence (Text-fig. 41). The amphids are elongate, lateral slits which lie slightly posterior to the origins of the cephalic setae (Text-fig. 42). There are in addition dorso-lateral terminal pore-like structures, the amphidules, which are discussed above (p. 215). The mouth opening is surrounded by the usual fringe of cuticle which is supported by twelve rugae. There is a very complicated arrangement of tooth-like structures within the buccal cavity. Dorsally there is a very large, wholly cuticular tooth with a massive base which expands laterally when viewed *en face* (Text-fig. 41). This large tooth is set fairly far posteriorly within the buccal cavity (Text-figs. 42 and 43) and the extreme anterior dorsal edge of the oesophagus carries a series of small denticle-like structures (Text-figs. 41 and 43). Laterally, viewed *en face*, at the extreme anterior end the oesophagus is modified into two pairs of cuticular tooth-like structures while ventrally there is a single pair of long, wholly cuticular, curved bars below (i.e. posterior to) which is a further pair of cuticular tooth-like structures. The distribution of these various structures is shown in Text-figs. 41, 42 and 43.

The oesophagus expands slightly posteriorly but there is no definite bulb.

Tail

The tail in both sexes is rather long and narrow with a distinctly set-off spinerette. The caudal glands lie posterior to the cloacal opening or anus.

Male

The spicules are equal in length, identical in structure, non-alate and rather sharply curved so that they are slightly elbow-like when viewed from the lateral aspect

---

FIGS. 41–51. *Euchromadora gaulica* sp. nov. Fig. 41. *En face* view of head. Note the amphidules and the elaborate arrangement of teeth and cutting blades at the anterior end of the oesophagus. Fig. 42. Lateral view of head with the dorsal surface to the right. Fig. 43. Dorsal view of head. Figs. 44–49. Detail of the structure of the lateral cuticle. Fig. 44 : just posterior to the head ; Fig. 45 : about the level of the posterior end of the oesophagus ; Fig. 46 : just anterior to the middle of the body ; Fig. 47 : the point of change where the lateral plates become directed posteriorly ; Fig. 48 : about the level of the anus or the cloacal opening ; Fig. 49 : on the tail. Fig. 50. Lateral view of spicules and gubernaculum. Fig. 51. Ventral view of spicules and gubernaculum.

(Text-fig. 50). The gubernaculum is slightly more than half the length of the spicules. The lateral flanking pieces of the gubernaculum are bluntly rounded proximally and narrow evenly toward the distal ends where they are very slightly turned ventrally (Text-figs. 50 and 51). There is only one testis.

Female

The reproductive tract is double with opposed, non-reflexed, ovaries which lead into large uteri containing relatively large numbers of eggs. The eggs are spherical, about 0·060 mm. in diameter.

Discussion

This species falls into the group mentioned by Brunetti (1952) and by Wieser (1955) which is characterized by an oesophagus which has no posterior bulb and with equal and identical spicules in the male. There are currently four species which fall into that group, *E. striata* (Eberth, 1863), *E. africana* Linstow, 1908, *E. permutabilis* Wieser, 1954 and *E. tokiokai* Wieser, 1955. Of these species *E. striata* is characterized by stout spicules, such as are figured by Eberth (1863), Filipjev (1918) and by Brunetti (1952) but not by Wieser (1952 and 1954), and a gubernaculum with a long, sharply-pointed, markedly bent, non-dentate distal end. *E. africana*, although recorded since the original description (Schuurmans Stekhoven, 1950 ; Steiner, 1918), cannot really be identified from the very poor description given by Linstow (1908) nor, with certainty, from either of the later redescriptions. I therefore propose to treat *E. africana* as a *species dubia*. *E. permutabilis* appears to be characterized by a gubernaculum in which the lateral pieces are evenly pointed proximally and sharply pointed and markedly bent distally, while *E. tokiokai* has lateral pieces to the gubernaculum which are blunt proximally and sharp-pointed with very little curvature distally. In both the latter species the gubernaculum is about 66% of the lengths of the spicules while in *E. striata* it is about 50%. *E. gaulica* is, therefore, characterized by equal and identical spicules, a gubernaculum which is about 60% of the length of the spicules and is only very slightly curved at the distal end. In addition the form of the lateral plates with the two pore-like holes appears to be distinctive. This latter character may be of the greatest systematic importance but it is impossible to be sure on the basis of the available descriptions (see the description of *E. tyrrenica* which follows). The *E. africana* of Schuurmans Stekhoven (1950) may be conspecific with *E. gaulica* but the poverty of the description is such that this cannot be established and I treat this record as that of a *species dubia*.

Euchromadora tyrrenica Brunetti, 1952

Material Studied

1 ♂ which was later lost.

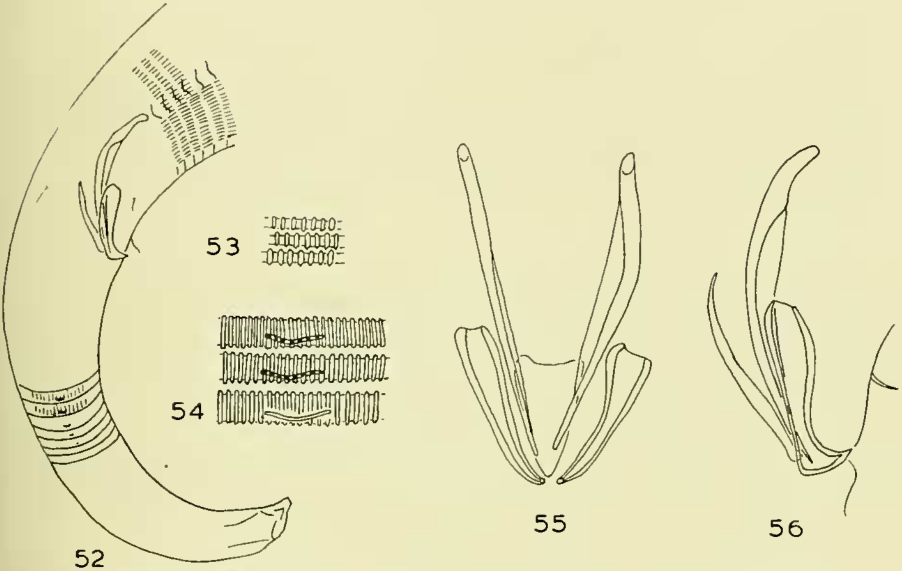
Ratios			
a	*b*	*c*	Body length
25·8	5·5	8·1	1·54

Measurements (*in mm.*)

Oesophagus length : 0·28. Head diameter : 0·032. Length of cephalic setae : 0·009. Nerve ring from anterior end : 0·114. Excretory pore from anterior end : 0·140. Tail length : 0·19. Cloacal diameter : 0·046. Spicule length : 0·053. Gubernaculum : 0·031. Width of lateral fields : at head, 0·003 ; at posterior end of oesophagus, 0·005 ; at middle of body, 0·005 ; at anus, 0·004 ; on tail, 0·003.

Cuticle

The cuticular markings are almost exactly the same as those on *E. gaulica* (Text-figs. 53 and 54) but there are no distinct lateral plates although there are what appear to be homologous, slightly curved structures present. These are apparent as slightly curved rods (? thickened plates in optical section) which are directed anteriorly over the anterior half of the body and posteriorly over the posterior half (Text-fig. 54). There are no distinct lateral holes associated with these rods/plates as in *E. gaulica*.



Figs. 52–56. *Euchromadora tyrrenica* Brunetti, 1952. Fig. 52. Male tail from the lateral aspect. Fig. 53. Cuticular pattern just posterior to head. Fig. 54. Cuticular pattern on the posterior half of the body. Fig. 55. Ventral view of spicules and gubernaculum. Fig. 56. Lateral view of spicules and gubernaculum, from the right.

Head and Oesophagus

The head appears to be identical in structure with that of *E. gaulica* but the amphids have not been seen. The oesophagus swells to form a distinct posterior bulb, without valvular structures.

Tail

The tail is relatively long and rather stout.

Male

The spicules are equal in length and identical in structure. They appear to carry very narrow alae, which are not figured by Brunetti (1952) but may have been overlooked (Text-fig. 56). The lateral pieces of the gubernaculum are stout with blunt proximal ends and rather massive distal ends which terminate in very sharp points but bear no denticles (Text-figs. 52 and 56). The gubernaculum is 58% of the spicules in length. There is a single testis.

Discussion

This specimen is very similar to *E. tyrrenica* and differs markedly from the description given by Brunetti (1952) only in the presence of narrow alae on the spicules, which could have been overlooked very easily. The slight markings on the lateral fields which probably correspond to the lateral plates of *E. gaulica* are rather characteristic although they also were probably overlooked by Brunetti.

Hypodontolaimus colesi sp. nov.

Material Studied

1 ♂, 1 ♀ (+ 1 very badly damaged ♀ used for an *en face* preparation). B.M. (N.H.), Reg. Nos. 1961.354–355. Male selected as holotype, 1961.354.

	Ratios				
	a	*b*	*c*	V	Body length
Male . .	26·5	7·3	9·2	—	0·98
Female . .	19·4	7·3	9·1	49·5	1·03

Measurements (*in mm.*)

Male. Body breadth : 0·037. Oesophagus length : 0·134. Head diameter : 0·020. Oesophageal bulb, length : 0·025 (approx.) ; breadth : 0·022. Cephalic setae length : 0·022. Body setae : 0·031–0·047. Nerve ring from anterior end : 0·076. Excretory pore not seen. Spicule length : 0·039. Gubernaculum length : 0·026. Tail length : 0·107. Cloacal diameter : 0·030. Tail length/cloacal diameter : 3·57.

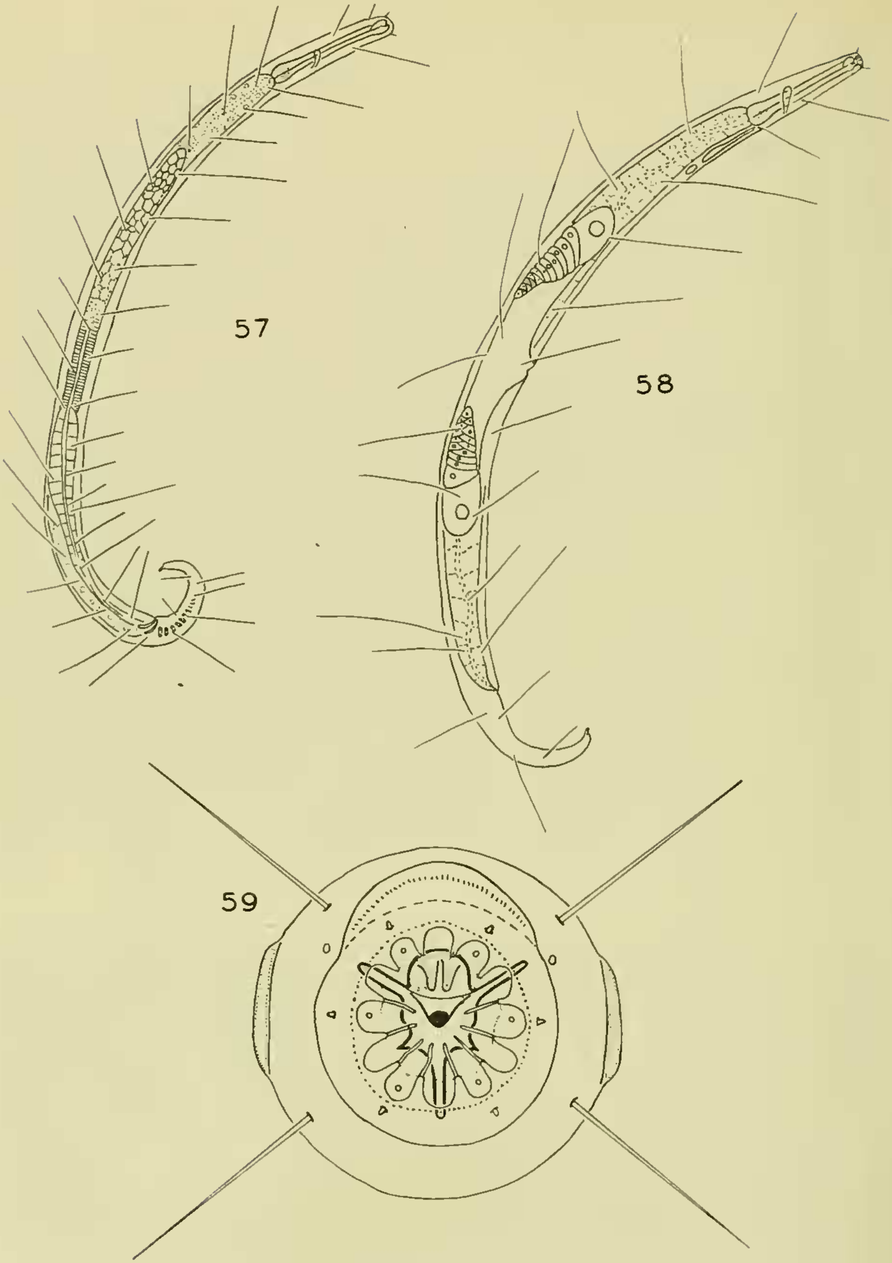
Female. Body breadth : 0·053. Oesophagus length : 0·141. Head diameter : 0·021. Oesophageal bulb, length : 0·042 (approx.) ; breadth : 0·037. Nerve ring from the anterior end : 0·078. Excretory pore not seen. Tail length : 0·113. Anal diameter : 0·026. Tail length/anal diameter : 4·4. Vulva from the anterior end : 0·51.

Cuticle

The cuticle is differentiated laterally by two files of large dots separated by lateral bars (Text-fig. 60) which are about 0·005 mm. wide just posterior to the head, lengthening to about 0·009 mm. about the posterior end of the oesophagus and remaining about this width until just anterior to the anus or cloacal opening where they shorten, being about 0·005 mm. wide at the level of the anus or the cloacal opening. The bars are about 0·002 mm. apart antero-posteriorly. The files of large dots are flanked by rows of smaller markings which extend laterally for about the same distance as the lengths of the lateral bars, that is, the total lateral differentiation equals approximately three times the length of the lateral bars at any given level. The markings flanking the large dots are rather round in shape anterior to the posterior end of the oesophagus (Text-fig. 62) and become relatively closer together, antero-posteriorly, anteriorly until the differentiation ceases just posterior to the cephalic setae (Text-fig. 60). In the middle region of the body the rows of the lateral differentiation are relatively far apart and the markings are rather small (Text-fig. 63) while from about the level of the anus, or the cloacal opening, the rows of markings become increasingly closer together, more prominent and longer (Text-fig. 64). The zone of lateral differentiation is raised above the general surface of the body (Text-fig. 59). There are two files of very long, thin setae running almost the full length of the body. These files of setae arise from just outside the files of large markings (Text-figs. 63, 64 and 65) and some of these larger markings are replaced by the openings of lateral pores (Text-figs. 63 and 64) along the middle part of the body length. These pores are not the bases of broken setae since the setae always arise lateral to them. The lateral bars appear to be further modified by lateral plates which are directed anteriorly over the whole length of the body (Text-figs. 63, 64 and 65). These structures, which become progressively less prominent anterior to the posterior end of the oesophagus until they disappear about the level of the nerve ring, appear to be comparable to the lateral plates found in species of *Euchromadora* (see p. 00). Such plates and the lateral pores do not appear to have been reported from species of this genus before.

Head and Oesophagus

The head is rather blunt and evenly rounded and bears four long, thin setae in an outer circle, six slightly setose papillae in an intermediate circle and an inner circle of six small sessile papillae (Text-figs. 59 and 60). Thus there are only four long setae, not ten as has been reported for *H. schuurmansstekhoveni* Gerlach, 1951*a* and *H. setosa* (Bütschli, 1874). The mouth opening is large and roughly circular, surrounded by the usual fringe of cuticle which is supported by twelve rugae (Text-fig. 59). The amphids are elongate lateral slits lying about the level of the origins of the four long setae (Text-fig. 60) and there is a pair of what appear to be amphidules dorso-lateral in position (Text-fig. 59). The presence of the amphidules is quite certain but I cannot be absolutely certain about the presence of the slit-like amphids. There is a very prominent S-shaped dorsal tooth and the dorsal sector of the anterior end of the oesophagus is very strongly swollen by the muscles which



Figs. 57–59. *Hypodontolaimus colesi* sp. nov. Fig. 57. Entire male from the right. Fig. 58. Entire female from the right. Fig. 59. *En face* view of head. Note the dorsal development of the oesophageal musculature and the presence of the amphidules.

supply it (Text-figs. 59 and 60). In optical section, *en face*, it can be seen that this dorsal swelling forms a distinct bump projecting dorsally from the circular section of the more ventral part of the oesophagus (Text-fig. 59). In addition to the large dorsal tooth there are two small, wholly cuticular denticles which are borne on the ventro-lateral sectors of the oesophagus near their anterior ends. Anterior to the large dorsal tooth is a thickened cuticular plate-like structure, in lateral view, which when studied *en face* is seen to be paired (compare Text-figs. 59 and 60). The lumen of the oesophagus at the anterior end is not simply tri-radiate but each ventro-lateral sector is partly divided into two lobes very similar in appearance to the condition in *Euchromadora* (see Text-fig. 59), but without the complex arrangement of ridges and teeth so characteristic of that genus. The oesophagus swells evenly at the posterior end but does not develop into a distinct posterior bulb such as that figured by Gerlach (1951*a*) as occurring in *H. schuurmansstekhoveni*, but there is a slight thickening of the cuticle lining the posterior lumen of the oesophagus (Text-fig. 61).

Tail

The tail is rather stout in both sexes and does not extend into a long, narrow terminal zone as in *H. schuurmansstekhoveni*. The spinerette opens through a terminal duct which projects from the ventral part of the tail (Text-fig. 65) and in this respect also it is different from *H. schuurmansstekhoveni*.

Male

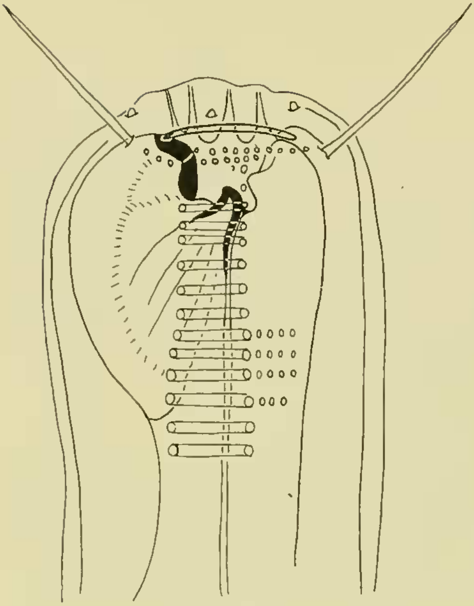
The spicules are equal in length and identical in structure, about the same width along most of their lengths. They are evenly curved and narrow very rapidly just before their posterior ends so that they terminate in long narrow points (Text-fig. 65). The gubernaculum is simple, without any apophysis, and bears slight lateral flanges just before its posterior end, flanges which slightly enfold the spicules (Text-fig. 65). There are no pre-cloacal supplements nor special setae. There is a single testis (Text-fig. 57).

Female

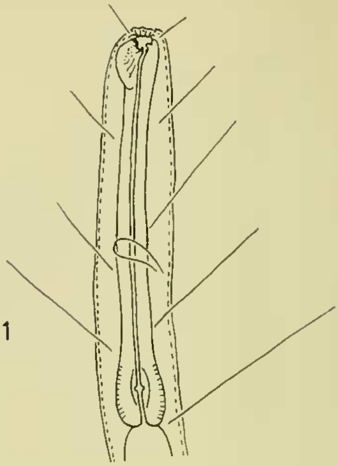
The reproductive apparatus is double with opposed, reflexed ovaries which lead into large uteri. The female specimen contains no eggs (Text-fig. 58).

Discussion

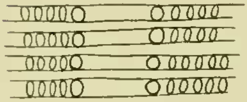
This species is most similar to *Hypodontolaimus schuurmansstekhoveni* Gerlach, 1951*a*, from which it differs in the form of the posterior end of the oesophagus, the shape of the terminal part of the tail, the short circle of intermediate setose papillae on the head and in the form of the spicules with a distinct swelling just anterior to the posterior end.



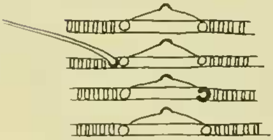
60



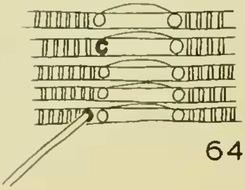
61



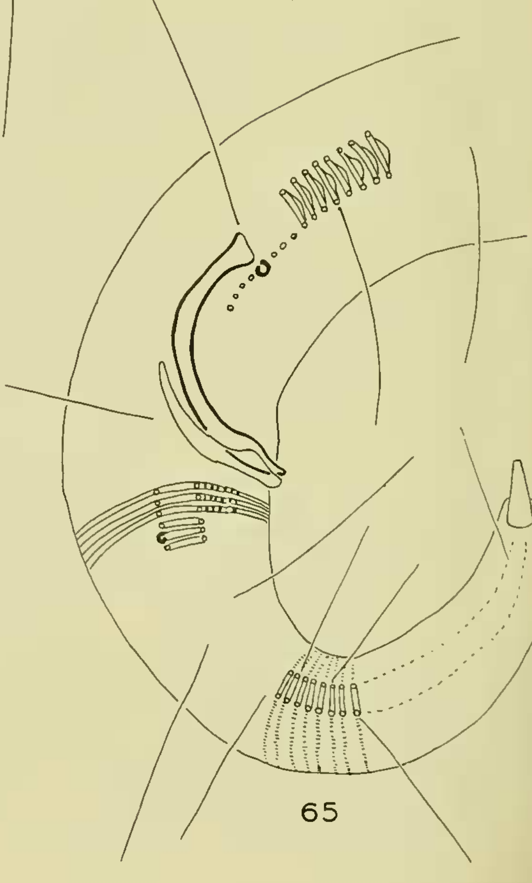
62



63



64



65

Paracanthonchus barka sp. nov.

Material Studied

1 ♂, B.M. (N.H.), Reg. No. 1961.353. Holotype.

Ratios			
a	*b*	*c*	Body length
30·7	4·8	10·3	0·86

Measurements (in mm.)

Body breadth: 0·028. Oesophagus length: 0·180. Head diameter: 0·015. Length of long cephalic setae: 0·006. Length of short cephalic setae: 0·005. Diameter of amphids, left: 0·008; right: 0·007. Distance of amphids from anterior end: 0·005. Tail length: 0·074. Cloacal diameter: 0·025. Tail length/cloacal diameter: 3·0. Gubernaculum length: 0·018. Spicule length: 0·019. Nerve ring from anterior end: 0·089 (?). Excretory pore from anterior end: 0·024 (?).

The single specimen is in a rather poor condition but it has been possible to see all the important systematic characters. The amphids lie fairly far posterior to the anterior end of the body, the distance as measured probably does not give a true impression as the anterior end of the body appears to be somewhat invaginated (Text-fig. 66) so that the inner setae have not been seen. The right amphid has four and a half spirals and the left has five and a half. The punctations on the cuticle start slightly posterior to the bases of the cephalic setae and are larger and more prominent laterally. There are the usual rows of pores for the lateral glands. The oesophagus is relatively stout, expanding slightly towards the posterior end. The measurements given above for the positions of the nerve ring and excretory pore are open to some doubt as I am not sure that I really did see these structures.

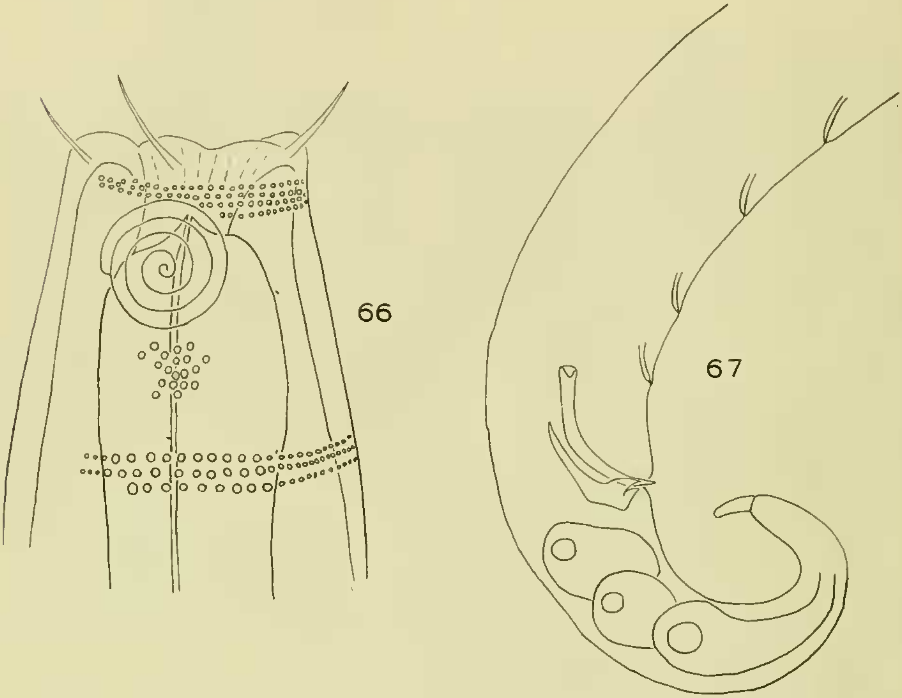
The tail is fairly stout, narrowing evenly posteriorly to terminate in a rather long spinerette. The caudal glands lie posterior to the cloacal opening. There are four pre-cloacal tubuli on the mid-ventral surface of the body anterior to the cloacal opening (Text-fig. 67).

The spicules are equal in length and identical in structure, curved, non-alate and terminate posteriorly in simple points. The gubernaculum ends distally in a rather sharp, rounded point, is bent about half-way along its length and expands very rapidly along approximately the proximal half of its length. It remains roughly the same width all along the distal half of its length and ends distally in a bluntly expanded mass which is developed on the edge nearer the spicules into two small, sharp teeth (Text-fig. 67).

FIGS. 60–65. *Hypodontolaimus colesi* (continued). Fig. 60. Lateral view of head with the dorsal surface to the left. Fig. 61. Structure of the oesophagus. Fig. 62. Cuticular pattern on the lateral surface just posterior to the head. Fig. 63. The same about the middle of the body. Fig. 64. The same posterior to the anus or cloacal opening. Note in this and the previous figure the lateral pores which are outlined by a very heavy solid black line and the way in which the lateral setae originate outside the lateral differentiating bars. Fig. 65. The male tail from the lateral aspect

Discussion

As Wieser (1954) points out, the best characters for the delimitation of genera and, to some extent, species in the subfamily Cyatholaiminae are those afforded by the structure of the gubernaculum and in this respect *P. barka* differs from all the previously described species of *Paracanthonchus*. It is most similar to the species grouped by Wieser (1954) in his group " B " (Wieser, 1954 : 16) but differs from them all in the outline of the gubernaculum and the relative simplicity of the proximal end of that structure. *P. serratus* Wieser, 1959, possesses a gubernaculum which is somewhat similar to that of *P. barka* in general outline but it differs in having the broad terminal plate-like part serrated. The gubernaculum of *P.* [=*Harveyjohnstonia*] *kartanum* (Mawson, 1953) is also a little like that of *P. barka* but also differs in having the blade-like part serrated.



Figs. 66–67. *Paracanthonchus barka* sp. nov. Fig. 66. Lateral view of head with the dorsal surface to the left. Fig. 67. Lateral view of male tail from the right.

Wieser (1959) considers *Harveyjohnstonia* Mawson, 1953 to be a synonym of *Paracanthonchus* and with this I concur.

Sphaerocephalum chabaudi sp. nov.

Material Studied

5 ♂, 9 ♀, 16 larvae. B.M. (N.H.), Reg. Nos. 1961.284–314. Holotype male, Reg. No. 1961.284.

This species is long and thin with a blunt anterior end and is easily recognized when seen alive. It is also easy to pick out when killed with heat as it coils up into a fairly tight spiral (Text-fig. 72). The cuticle is thin and bears no obvious striations.

Larva I

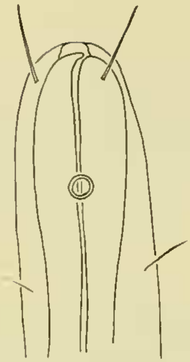
The body of the only specimen of this larval stage is 0·78 mm. long by 0·016 mm. wide; the oesophagus, which is identical with that of the adults in structure is 0·016 mm. long; the diameter of the head is 0·015 mm.; the cephalic setae are 0·008 mm. long; the amphid is 0·005 mm. in diameter and lies 0·018 mm. from the anterior end; the tail is 0·076 mm. long and the nerve ring lies 0·074 mm. from the anterior end. $a = 48{\cdot}7$; $b = 6{\cdot}0$; $c = 10{\cdot}3$.

The most startling feature of this larval stage (? second) is that the amphid is a simple circular depression without any central elevation or any indication of its being spiral and that the head bears only four long setae (Text-fig. 68). Otherwise the head is identical with that of the adult. That is, the buccal cavity is short and the extreme anterior end of the dorsal sector of the oesophagus projects over the ventro-lateral sectors (see below, p. 276). There are a few longish setae scattered over the anterior end of the body.

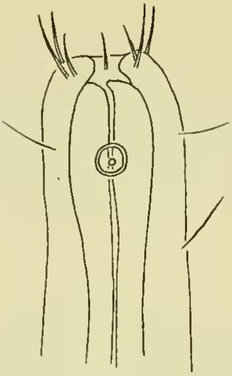
Larva II

In this larval stage(s) two specimens have been measured. The body is 1·04 mm. long in one and 2·61 mm. long in the other; they are 0·027 mm. and 0·048 mm. wide respectively; the oesophagus is 0·180 mm. and 0·280 mm. long; the cephalic setae are 0·008 mm. and 0·012 mm. long in the shorter and 0·009 mm. and 0·014 mm. long in the longer; the tail is 0·087 mm. and 0·160 mm. long; the head is 0·021 mm. and 0·031 mm. in diameter; the amphids are 0·006 mm. and 0·008 mm. in diameter and lie 0·015 mm. and 0·019 mm. from the anterior end; the nerve ring is 0·092 mm. and 0·149 mm. and the excretory pore is 0·058 mm. and 0·113 mm. from the anterior end; the anal diameter is 0·020 mm. and 0·041 mm. $a = 38{\cdot}5$ and $54{\cdot}4$; $b = 5{\cdot}5$ and $9{\cdot}3$; $c = 12{\cdot}0$ and $16{\cdot}3$.

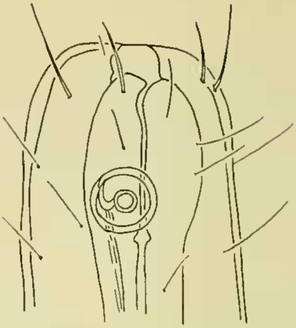
It is probable that these specimens represent different larval stages, the third and the fourth (?). Structurally, however, they are identical. The head bears two circles of longish setae and there are several long setae scattered over the anterior end of the body. The amphid is circular with a distinct central elevation (Text-fig. 69). The structure of the oesophagus and the tail is identical with that found in the adults.



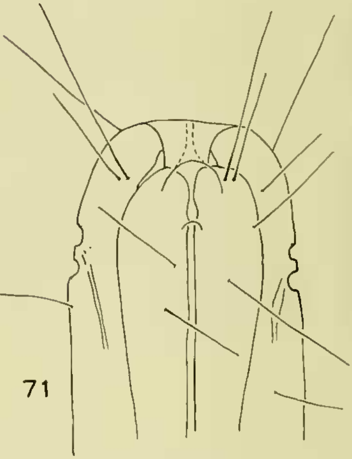
68



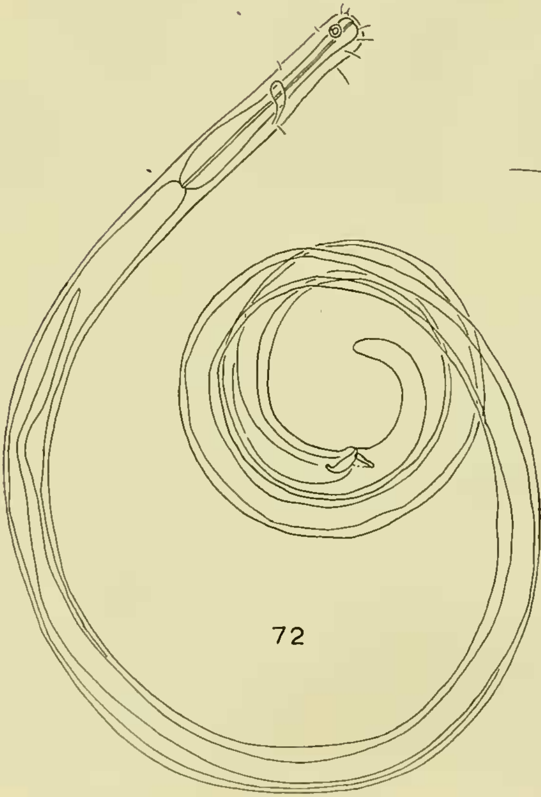
69



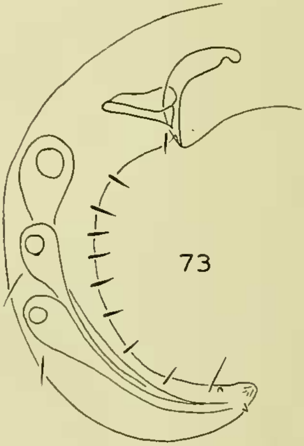
70



71



72



73

Adult

	Ratios				
	a	*b*	*c*	V	Body length
Males . .	73·1	11·4	18·8	—	2·85
	74·1	12·2	18·5	—	3·04
	82·1	15·2	19·6	—	3·20
Females . .	66·7	9·5	16·6	45·5	2·66
	59·1	10·8	20·3	49·8	3·13
	65·5	12·3	26·8	44·7	3·80

Measurements (in mm. ; in order of body lengths above)

MALES. Body breadth: 0·039; 0·041; 0·039. Oesophagus length: 0·25; 0·25; 0·21. Diameter of head: 0·026; 0·032; 0·032. Diameter of amphid: 0·012; 0·010; 0·011. Nerve ring from the anterior end: 0·126; 0·120; 0·123. Excretory pore from the anterior end: 0·101; 0·097; 0·094. Length of spicules: 0·036; 0·042; 0·041. Length of gubernaculum: 0·020; 0·023; 0·022. Length of tail: 0·152; 0·164; 0·163. Cloacal diameter: 0·033; 0·042; 0·044. The extreme thinness of the cephalic setae makes them very difficult to measure but the long setae appear to be about 0·014 mm. and the short about 0·011 mm. long in all the specimens.

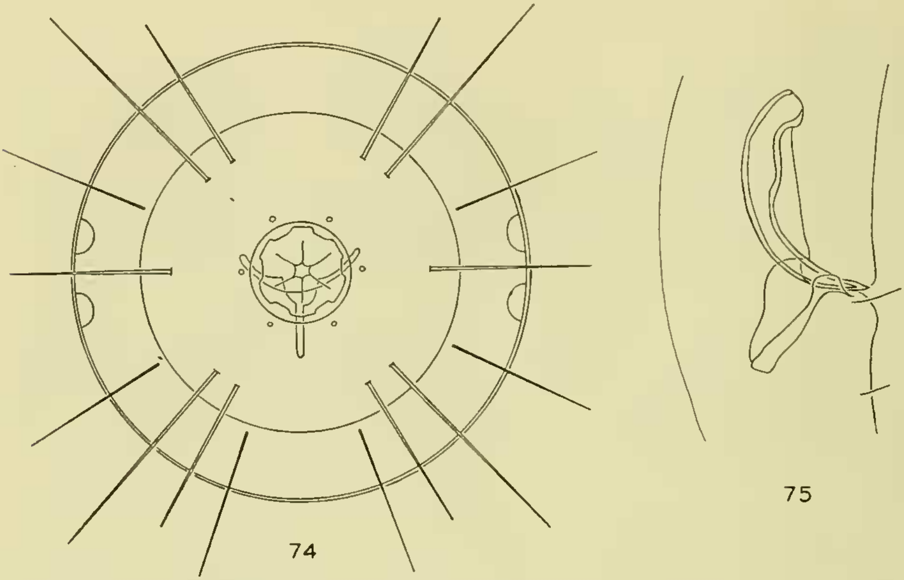
FEMALES. Body breadth: 0·040; 0·053; 0·058. Oesophagus length: 0·28; 0·29; 0·31. Diameter of head: 0·034; 0·039; 0·041. Diameter of amphid: 0·011; 0·009; 0·014. Nerve ring from anterior end: 0·138; 0·133; 0·137. Excretory pore from anterior end: 0·118; 0·102; 0·122. Length of tail: 0·160; 0·154; 0·142. Anal diameter: 0·036; 0·032; 0·039. Distance of vulva from anterior end: 1·21; 1·56; 1·71.

Head and Oesophagus

The head bears an inner circle of six small sessile, inconspicuous papillae and an outer circle of ten long, very thin, setae of which six are short and four are long (Text-fig. 74). Posterior to this circle of ten setae are a number of similar setae which become shorter and less prominent posteriorly and which disappear about the level of the nerve ring (Text-figs. 70 and 71). The amphids are circular but of a crypto-spiral nature with the amphidial nerve entering on the dorsal side. They are about one-third of the corresponding body width in diameter. The small mouth

FIGS. 68–73. *Sphaerocephalum chabaudi* sp. nov. Fig. 68. Head of Larva—I with the dorsal side to the left. Note the simple pore-like form of the amphid. Fig. 69. Head of Larva—II, with the dorsal side to the right. Note the central elevation to the amphid. Fig. 70. Head of adult with the dorsal surface to the left. Note the distinctly spiral nature of the amphid with the dorsal innervation. Fig. 71. Head of adult from the dorsal aspect. Fig. 72. Entire male from the right. Fig. 73. Male tail from the lateral aspect.

opening is bounded by six thin lip-lobes which are supported by six processes developed from the anterior edge of the thin cuticular lining of the circular buccal cavity (Text-figs. 71 and 74). The spaces between these processes are very prominent, particularly when the head is studied from the dorsal aspect (Text-fig. 71) and this probably explains the rather strange structures shown by Filipjev (1918) in his figure of the head of *Sphaerocephalum crassicauda* (Filipjev's fig. 75*b*). The dorsal sector of the oesophagus is developed as a lobe which projects ventrally to lie over the paired ventro-lateral sectors and is most obvious in lateral and *en face* views (Text-figs. 70 and 74).



FIGS. 74–75. *Sphaerocephalum chabaudi* (continued). Fig. 74 *En face* view of adult head. Note the six-lobed mouth opening and the way in which the ventro-lateral sectors of the oesophagus are covered by the lobe developed from the dorsal sector. (The cephalic setae are unfilled while the cervical setae are drawn solid black.) FIG. 75. Lateral detail of the spicules and gubernaculum.

The anterior end of the oesophagus is slightly swollen and it broadens evenly from just posterior to the nerve ring but there is no distinct posterior bulb (Text-fig. 72). There is no cardia. The nerve ring lies just posterior to the excretory pore.

Tail

The shape of the tail is the same in both sexes (Text-figs. 72 and 73). It is about the same width along most of its length and ends posteriorly in a blunt tip. The three caudal glands lie posterior to the anus or cloacal opening.

Male

The spicules are equal in length and identical in structure. They are sickle-shaped with distinct swellings on their ventral surfaces over most of the anterior third to half their lengths. Posteriorly they are slightly swollen just before their extreme, sharply pointed, tips (Text-fig. 75). The gubernaculum consists of two side pieces which are directed dorso-posteriorly with blunt posterior ends and which are developed into sharply pointed heads at the ends nearer the cloacal opening (Text-fig. 75). There is a thin, lightly cuticularized plate-like median structure lying between the spicules. The tail bears up to ten pairs of long, thin setae on its ventral surface and a few similar setae are scattered generally over the remainder of its surface (Text-fig. 73). No setae have been seen anterior to the cloacal opening. There is a single testis (Text-fig. 72).

Female

There are two opposed, extended ovaries and there are no obvious oviducts. The eggs, of which up to six have been seen in a single specimen, are long and narrow, 0·113 × 0·037 mm.–0·138 × 0·041 mm. in size. The vulva opens slightly anterior to the middle of the body length, V = 45·5–49·8.

Discussion

This species is similar to *Sphaerocephalum crassicauda* Filipjev, 1918 (the type species of the genus) but differs from it in that Filipjev reported his species, based on one female only, to have only one ovary, but two uteri. This description appears improbable but the position cannot be cleared up until more specimens from the same locality have been studied. At least three further species have been referred to the genus: *S. longicaudatum* Schuurmans Stekhoven, 1935, *S. bulbiferum* Schuurmans Stekhoven, 1943 and *S. hirsutum* Gerlach, 1954. The first two species are described as having distinct cardia (elongate oesophageal-intestinal valves) and such structures are definitely not present in *S. chabaudi*. Of Schuurmans Stekhoven's species the first was described from one female specimen and the second from one juvenile. From the descriptions it is impossible to be sure whether or not these species are congeneric with *S. crassicauda* and *S. chabaudi*. Schuurmans Stekhoven (1935) expresses doubt as to the accuracy of Filipjev's (1918) description and infers that a cardia might have been present but such a structure is definitely not present in my specimens, nor is it mentioned by Gerlach (1954), and I am prepared to accept Filipjev's description as accurate. Further neither of Schuurmans Stekhoven's specimens appears to have the same arrangement of long setae posterior to the head as that found in the other species and I am of the opinion that both *S. longicaudatum* and *S. bulbiferum* should be treated as species *incertae sedis*, at least, and more probably warrant treatment as *species dubiae*.

Gerlach (1954) describes *S. hirsutum* sp. nov. from Banyuls-sur-Mer but he only studied female specimens. His specimens had only four long cephalic setae and he suggests that Filipjev (1918) may have been in error in describing ten on *S. crassicauda* but ten are present on the adults of *S. chabaudi*. The structure of the anterior end of the oesophagus and the buccal cavity also appears to be different in *S. hirsutum*, particularly the form of the dorsal sector of the oesophagus which does not appear to be lobed as in *S. chabaudi*. The two species also appear to differ in the form of the amphid, possibly a less significant character, and are markedly different in the relative lengths of the female tails.

Sphaerocephalum chabaudi is, therefore, distinct in the presence of two ovaries, the form of the head, the number of cephalic setae, the form of the amphids and the relative length of the tail. As this is the first species of the genus in which the male is known the genus *Sphaerocephalum* may be fully diagnosed, thus :

SPHAEROCEPHALUM Filipjev, 1918

Linhomoeidae : anterior end blunt ; papillae of inner circle small and sessile ; outer circles of setae lying at approximately the same level (?), with four of the circle longer than the remaining six ; mouth opening surrounded by six small lip-lobes supported by six prolongations of the lining of the buccal cavity ; dorsal sector of the oesophagus developed as a lobe overlying the ventro-lateral sectors (?) ; amphid circular with one spiral ; oesophagus without posterior bulb or cardia ; long cervical setae present ; tail fairly long and of an even breadth. MALE : spicules relatively massive ; gubernaculum composed of two posteriorly directed lateral apophyses with a plate-like central structure ; no pre-cloacal supplements or setae.

Type species : *Sphaerocephalum crassicauda* Filipjev, 1918.

GEOGRAPHICAL DISTRIBUTION. Mediterranean and Black Seas.

ACKNOWLEDGEMENTS

I wish to express my thanks to the Directeur, M. le Professeur G. Pettit, the Sous-directeur, M. le Dr. (now Professeur) C. Delamare Deboutteville, and the staff of the Laboratoire " Arago ", Banyuls-sur-Mer for the assistance they afforded me during my stay in the laboratory during September, 1959. Without the help and kindness of M. le Professeur Alain G. Chabaud and his family my visit to Banyuls could not have been as valuable as it was and I wish to acknowledge my deep indebtedness to them.

LIST OF NOMENCLATORIAL CHANGES PROPOSED

Chromadora laeta de Man, 1876 = *species dubia*.
Chromadora laeta of Daday, 1901 = *species dubia*.
Chromadorina laeta of Micoletzky, 1924 = *Chromadorina micoletzkyi* nom. nov.
Enoplostoma [= *Enoplus*] *hirtum* Marion, 1870 = *Enoplus quadridentatus* Berlin, 1853.
Enoplus tridentatus Dujardin, 1845 = *species dubia*.
Euchromadora africana Linstow, 1908 = *species dubia*.
Euchromadora africana of Steiner, 1918 = *species dubia*.
Euchromadora africana of Schuurmans Stekhoven, 1950 = *species dubia*.

Eurystomina Filipjev, 1921.
- *americana* of Chitwood, 1951 = *E. chitwoodi* nom. nov.
- *assimile* of Gerlach, 1951 = *E. gerlachi* nom. nov.
- *assimile* of Filipjev, 1918 = *E. filiformis* (in part) and *E. ornata* (in part).
- *assimile* of Schuurmans Stekhoven, 1943 = (?) *E. gerlachi* (in part) and (?) *E. pettiti* (in part).
- *assimilis* of Gerlach, 1951 = *E. gerlachi* nom. nov.
- *assimilis* (de Man, 1876) = *species dubia.*
- *bilineata* Wieser, 1953 = *species inquirenda.*
- *californica* Allgén, 1947 = *species dubia.*
- *filicaudata* Allgén, 1959 = *species dubia.*
- *filicolle* Allgén, 1959 = *species dubia.*
- *filispiculum* Gerlach, 1954 = *Gerlachystomina filispiculum* comb. nov.
- *froyense* Allgén, 1946 = *species dubia.*
- *linstowi* Allgén, 1959 = *species dubia.*
- *lithothamnii* Saveljev, 1912 = *species inquirenda.*
- *littorale* Allgén, 1929 = *species dubia.*
- *minutisculae* of Timm, 1954 = *E. americana* Chitwood, 1936.
- *mirabile* Allgén, 1959 = *species dubia.*
- *norvegica* Allgén, 1947 = *species inquirenda.*
- *ornatum* of Wieser, 1955 = *E. opthalmophora* (Steiner, 1922).
- *ornatum* of Chitwood, 1960 = *E. opthalmorphora* (Steiner, 1922).
- *ornatum* var. *indicum* Micoletzky, 1930 = (?) *E. opthalmophora* (Steiner, 1922).
- *paralittorale* Timm, 1951 = *species dubia.*
- *propinqua* Allgén, 1947 = *species dubia.*
- *retrocellatum* of Wieser, 1953 = *E. chilensis* nom. nov.
- *sawayai* Gerlach, 1954 = *Gerlachystomina sawayai* comb. nov.
- *spissidentata* Allgén, 1947 = *species inquirenda.*
- *stenolaima* of Wieser, 1953 = *E. wieseri* nom. nov.
- *stenolaimoides* Wieser, 1953 = *species dubia.*
- *tenue* Marion, 1870 = *E. spectabilis* (Marion, 1870).
- *tenuissima* Filipjev, 1927 = *species incertae sedis.*
- *terricola* de Man, 1907 = *species dubia.*
- *trichophora* Allgén, 1959 = *species dubia.*
- *trichura* Allgén, 1953 = *species dubia.*

Oncholaimus bollonsi Ditlevsen, 1930 = *species inquirenda.*

Oncholaimus dujardini of Wieser, 1953 and 1955 = (?) *O. steineri* Schuurmans Stekhoven, 1950.

Oncholaimus dujardini of Mawson, 1958 = (?) *O. steineri* Schuurmans Stekhoven, 1950.

Oncholaimus exilis Cobb, 1889 = *species dubia.*

Sphaerocephalum longicaudatum Schuurmans Stekhoven, 1935 = *species incertae sedis.*

Sphaerocephalum bolbiferum Schuurmans Stekhoven, 1943 = *species incertae sedis.*

REFERENCES

Allgén, Carl. 1929. Südschwedische Marine Nematoden. *Göteborg. Vetensksamh. Handl.* Ser. B, **1** (2) : 1–40.

—— 1929*a*. Freilebende marine Nematoden aus den Umgebungen der stattlichen zoologischen Station Kristineberg an der Westkueste Schwedens. *Capita Zool.* **2** : 1–52.

—— 1931. Freilebende Nematoden aus dem Dröbakabschnitt des Oslofjords. *Zool. Jb.* (*Syst. Etc.*) **61** : 211–262.

—— 1932. Weitere Beiträge zur Kenntnis der marinen Nematodenfauna der Campbellinseln. *Nyt. Mag. Naturv.* **70** : 97–198.

—— 1933. Freilebende Nematoden aus dem Trondhjemsfjord. *Capita Zool.* **4** : 1–162.

—— 1939. Die Phanodermen des Mittelmeeres. *Festschrift zum* 60. *Geburtstage von Professor Dr. Embrik Strand.* **5** : 394–404.

—— 1940. Weitere freilebende Nematoden insbesondere aus dem Schalensand—und Kiesboden der Strandzone Norwegens. *Folia zool. hydrobiol.* **10** : 487–508.

—— 1942. Die freilebenden Nematoden des Mittelmeeres. Eine Zusammenstellung sämtlicher aus dem Mittelmeer bekannten Nematoden. *Zool. Jb.* (*Syst. etc.*) **76** : 1–102.

—— 1943*a*. Norwegische marine Nematoden. *Ibid.* **76** : 282–322.

—— 1946. Zur Kenntnis Norwegischer Nematoden VI. Neue freilebende marine Nematoden von der Insel Froya. *K. norske Vidensk. Selsk. Forh.* **18** : 160–162.

—— 1947. Papers from Dr. Th. Mortensen's Expedition 1914–16. LXXV. West American marine nematodes. *Vidensk. Medd. Dansk. naturh. Foren.* **110** : 65–219.

—— 1947*a*. Zur Kenntnis Norwegischer Nematoden. X. Neue freilebende marine Nematoden von der Insel Storfosen. *K. norske Vidensk. Selsk. Forh.* **19** : 52–55.

—— 1951. Papers from Dr. Th. Motensen's Expedition 1914–16. LXXVI. Pacific free-living marine nematodes. *Vidensk. Medd. Dansk. naturh. Foren.* **113** : 263–411.

—— 1953. Über einige meistens neue oder seltene freilebende Nematoden aus dem Gullmarfjord (Bohuslän, Westküste Schwedens). *Zool. Anz.* **151** : 86–95.

—— 1957. On a small collection of freeliving marine nematodes from Greenland and some other Arctic regions : with reviews and analyses of the compositions of all hitherto known Arctic nematode faunas. *Medd. Grønland.* **159** (3) : 1–42.

—— 1959. Freeliving marine nematodes. *Further zool. Res. Swed. Antarct. Exped.* **5** (2) : 1–293.

Anderson, Roy C. 1958. Méthode pour l'examen des Nématodes en vue apicale. *Ann. Parasit. hum. comp.* **33** : 171–172.

Andrássy, I. 1959. Ergebnisse der zoologischen Aufsammlungen des Ungarischen Naturwissenschaftlichen Museums in Ägypten im Jahre 1957. *Ann. hist.-nat. Mus. hung.* **51** : 247–257.

Basir, M. A. 1949. An easy method for the preparation of *en face* view of small nematodes. *Trans. Amer. micr. Soc.* **58** : 123–126.

Baylis, H. A. & Daubney, R. 1926. *A synopsis of the families and genera of Nematoda.* London. Trustees of the British Museum (Natural History).

Berlin, W. 1853. Ueber einen Wurm aus der Gruppe der Anguillulae, *Enoplus quadridentatus. Arch. Anat. Physiol. Lpz.* **1853** : 431–441.

Bresslau, E. & Schuurmans Stekhoven, J. H. 1940. *Marine Freilebende Nematoden aus der Nordsee.* 74 pp. Bruxelles : Musée Royal d'Histoire Naturelle de Belgique.

Brunetti, B. 1952. Osservazioni su alcune specie del genere *Euchromadora* de Man, 1886 (Nematoda-Chromadoridae). *Monit. zool. ital.* **59** : 73–81.

Bütschli, Otto. 1874. Zur Kenntnis der freilebenden Nematoden, insbesondere der des Kieler Hafens. *Abh. senckenb. naturf. Ges.* **9** : 237–292.

Chitwood, B. G. 1936. Some marine nematodes of the superfamily Enoploidea. *Trans. Amer. micr. Soc.* **55** : 208–213.

—— 1951. North American marine nematodes. *Texas J. Sci.* **3** : 617–672.

—— 1960. A preliminary contribution on the marine nemas (Adenophora) of Northern California. *Trans. Amer. micr. Soc.* **79** : 347–384.

Chitwood, B. G. & Chitwood, M. B. 1950. *An introduction to nematology. Section I. Anatomy, with contributions by R. O. Christenson, L. Jacobs and F. G. Wallace.* Baltimore. B. G. Chitwood.

Chitwood, B. G. & Timm, R. W. 1954. Freeliving nematodes of the Gulf of Mexico, in Chapter IX. Freeliving flatworms, nemerteans, nematodes, tardigrades, and chaetognaths. In : Gulf of Mexico, its origin, waters and marine life. (Co-ordinated by Paul S. Galsoff.) *Fish. Bull. U.S.* **9** : 313–323.

Chitwood, B. G. & Wehr, Everett E. 1934. The value of cephalic structures as characters in nematode classification, with special reference to the superfamily Spiruroidea. *Z. Parasitenk.* **7** : 273–335.

Cobb, N. A. 1917. Notes on nemas. (1) Segmentation in nematodes. *Contr. Sci. Nemat.* **5** : 117–120.

—— 1920. One hundred new nemas. (Type species of 100 new genera.) *Ibid.* **9** : 217–343.

—— 1922. *Marionella* (*Eurystoma* Marion, 1870) ; an emendation, with notes on a new birefringent substance, marionellin, found in the intestinal cells. *J. Wash. Acad. Sci.* **11** : 504–509.

Daday, Jenötöl. 1901. Szabadon élö fonálférgek a fiumei öbölböl. Freilebende Nematoden aus dem Quarnero. *Természetr. Fuz.* **24** : 433–457.

De Coninck, Lucien, A. P. 1942. De symmetrie-verhoudengen aan het vooreinde der (vrijlevende) Nematoden. *Natuurwet. Wijdschr.* **24** : 29–68.

De Coninck, Lucien A. P. & Schuurmans Stekhoven, J. H. 1933. The free living marine nemas of the Belgian coast. II. With general remarks on the structure and system of nemas. *Mém. Mus. Hist. nat. Belg.* **58** : 1–163.

Ditlevsen, Hjalmar. 1919. Marine freeliving nematodes from Danish waters. *Vidensk. Medd. Dansk. naturh. Foren.* **70** : 147–214.

—— 1926. Freeliving nematodes. *Dan. Ingolf-Exped.* **4** (6) : 1–42.

—— 1930. Papers from Dr. Th. Mortensen's Pacific Expedition 1914–16. LII. Marine freeliving nematodes from New Zealand. *Vidensk. Medd. Dansk. naturh. Foren.* **87** : 201–242.

Dujardin, F. 1845. *Histoire naturelle des Helminthes.* Paris.

Eberth, C. J. 1863. *Untersuchungen über Nematoden.* Leipzig.

Filipjev, I. N. 1918–21. [Freeliving nematodes from the region of Sevastopol. I and II.] *Trav. Lab. Zool. Sebastopol,* **2** (4) : 1–350 and 351–614 (in Russian).

—— 1927. Les nematodes libres des mers septentrionales appartenant a la famille des Enoplidae. *Arch. Naturgesch.* **91**A : 1–216.

—— 1934. The classification of the freeliving nematodes and their relation to the parasitic nematodes. *Smithsonian misc. Coll.* **89** (6) : 1–63.

Gerlach, Sebastian A. 1951. Freilebende Nematoden aus Varna an der bulgarischen Küste des Schwarzen Meeres. *Arch. Hydrobiol.* **45** : 193–212.

—— 1951*a*. Nematoden aus der Familie der Chromadoridae von den deutschen Küsten. *Sond. Kiel. Meeresforsch.* **8** : 106–132.

—— 1952. Die Nematoden-besiedlung des Sandstrandes und des Küstengrund-wassers an der italienischen Küste. I. Systematischer Teil. *Arch. zool. ital.* **37** : 517–640.

—— 1954. Nouveaux nématodes libres des eaux souterraines littorales françaises. *Vie et Milieu,* **4** : 95–110.

—— 1954*a*. Brasilianische Meeres-nematoden I. (Ergebnisse eines Studienaufenthaltes an der Universität São Paulo.) *Bol. Inst. Ocean. Univ. São Paulo,* **5** : 3–69.

—— 1954*b*. Die freilebenden Nematoden der schleswigholsteinischen Küsten. *Schr. naturw. Ver.* **27** : 44–69.

Goodey, J. Basil. 1957. Laboratory methods for work with plant and soil nematodes. *Ministry of Agriculture, Fisheries and Food, Technical Bulletin No.* 2. Her Majesty's Stationery Office, London.

Hartwich, Gerhard. 1952. Vergleichende mikroskopisch-anatomische Untersuchungen über den Kopfbau einiger Ascariden. *Wiss. Zeitschr. Martin-Luther Univ. Halle-Wittenberg. Math-naturwiss.* **1** : 71–83.

HYMAN, LIBBIE HENRIETTA. 1951. *The invertebrates : Acanthocephala, Aschelminthes, and Entoprocta. The pseudocoelomate bilateria.* Volume III. McGraw-Hill Book Company, Inc., New York, Toronto, London.

INGLIS, WILLIAM G. 1958. A revision of the nematode genera *Kathlania* and *Tonaudia*. *Ann. Mag. nat. Hist.* (12) **10** : 785–800.

—— 1958*a*. A new species of the nematode genus *Thoracostoma* from the Antarctic. *Ibid.* (13) **1** : 45–48.

—— 1961. Freeliving marine nematodes from South Africa. *Bull. Brit. Mus. nat. Hist.* **7** (6) : 291–319.

—— 1961*a*. Three species of *Cyatholaimus* Bastian, 1865 (Nematoda : free-living : marine). *Bull. Soc. zool. Fr.* **86** : 73–86.

LINSTOW, O. VON. 1908. Zoologische und Anthropologische Ergebnisse einer Forschungsreise im Westlichen und Zentralen Südafrika ausgeführt in Jahren 1903–1905. II. Helminthes, Nematoden und Acanthocephalen. *Densksch. med.-naturw. Ges. Jena,* **13** : 19–28.

LUC, MICHEL & DE CONINCK, L. A. 1959. Nématodes libres marines de la région de Roscoff. *Arch. zool. exp. gén.* **98** : 103–165.

DE MAN, J. G. 1876. Contribution à la connaissance des nématodes marins du Golfe de— Naples. *Tijdschr. ned. dierk. Ver.* **3** : 88–118.

—— 1886. *Anatomische untersuchungen über freilebende Nordsee-nematoden.* Leipzig.

—— 1888. Sur quelques nématodes libres de la Mer du Nord, nouveaux ou peu connus. *Mém. Soc. zool. Fr.* **1** : 1–51.

—— 1904. Nématodes libres. *Résult. " Belgica " Expéd. antarct.* (*Zoologie*), pp. 1–51.

—— 1907. Sur quelques espèces nouvelles ou peu connues de nématodes libres habitant les côtes de la Zélande. *Mém. Soc. zool. Fr.* **21** : 33–90.

MARION, M. A. F. 1870. Des nématoides non parasites, marins. *Ann. Sci. nat.* (*Zool.*) (5) **13** : article No. 14, 102 pp.

MAWSON, P. M. 1953. Some marine freeliving nematodes from the Australian coast. *Trans. roy. Soc. S. Aust.* **76** : 34–40.

—— 1956. Free-living nematodes. Section 1 : Enoploidea from Antarctic stations. *Rep. B.A.N.Z. Antarct. Res. Exped.* Ser. B, **6** (3) : 39–74.

—— 1958. Freeliving nematodes, Section 3 : Enoploidea from Subantarctic stations. *Ibid.* Ser. B, **6** (14) : 307–358.

MICOLETZKY, H. 1924. Weitere Beiträge zur Kenntnis freilebender Nematoden aus Suez. *S.B. Akad. Wiss. Wien,* **132** (1) : 225–262.

MICOLETZKY, HEINRICH. 1930. Papers from Dr. Th. Mortensen's Pacific Expedition 1914–16. LIII. Freilebende marine Nematoden von den Sunda-Inseln. I. Enoplidae. *Vidensk. Medd. Dansk. naturh. Foren.* **87** : 243–339.

SAVELJEV, S. 1912. Zur Kenntnis der freilebenden Nematoden des Kolafjords und des Relictensee Mogilnoje. *Trav. Soc. Nat. Leningr.* **43** : 108–126.

SCHUURMANS STEKHOVEN, J. H. 1935. Nematoda errantia. *Tierw. N.-u. Ostsee,* **5*b*** : 1–173.

—— 1943. Freilebende marine Nematoden des Mittelmeeres. IV. Freilebende marine Nematoden der Fischereigründe bei Alexandrien. *Zool. Jb.* (*Syst. Etc.*) **76** : 323–380.

SCHUURMANS STEKHOVEN, JACOBUS HERMANUS. 1950. The freeliving marine nemas of the Mediterranean. I. The Bay of Villefranche. *Mém. Inst. Sci. nat. Belg.* (2ième Ser.), **37** : 1–220.

SOUTHERN, R. 1914. Clare Island survey. Part 54. Nemathelmia, Kinorhyncha, and Chaetognatha. *Proc. R. Irish Acad.* **31** : 1–80.

STEINER, G. 1915. Freilebende marine nematoden von der Küste Sumatras. *Zool. Jb.* (*Syst. Etc.*) **38** : 223–244.

—— 1916. Freilebende Nematoden aus der Barentsee. *Ibid.* **39** : 511–676.

—— 1918. Neue und wenig bekannte Nematoden von der Westküste Afrikas. *Zool. Anz.* **50** : 4–18.

STEINER, G. 1922. Öst-asiatische marine Nematoden. *Zool. Jb.* (*Syst. Etc.*) **44** : 195–226.

STEINER, G. & HOEPPLI, R. 1926. Studies on the exoskeleton of some Japanese marine nemas. *Arch. Schiffs-u. Tropenhyg.* **30** : 547–576.

TIMM, R. W. 1953. Observations on the morphology and histological anatomy of a marine nematode, *Leptosomatum acephalatum* Chitwood, 1936, new combination (Enoplidae : Leptosomatinae). *Amer. Midl. Nat.* **49** : 229–248.

—— 1954. A survey of the marine nematodes of Chesapeake Bay, Maryland. *Biol. Stud. Cath. Univ. Amer.* **23** : 1–70.

—— 1960. A new species of *Leptosomatum* (Nematoda) from the Arabian Sea. *J. Helminth.* **34** : 217–220.

—— 1961. The marine nematodes of the Bay of Bengal. *Proc. Pakistan Acad. Sci.* **1** (1) : 1–88.

VILLOT, A. 1875. Recherches sur les helminthes libres ou parasites des Cotes de la Bretagne. *Arch. Zool. exp. gén.* **4** : 451–482.

WIESER, WOLFGANG. 1952. Untersuchungen über die algenbewohnende Mikrofauna mariner Hartböden. I. Zur Oekologie und Systematik der Nematodenfauna von Plymouth. *Öest. Zool. Z.* **3** : 425–480.

—— 1953. Der Sexualdimorphismus der Enchelidiidae (freilebende marine Nematoden) als taxonomisches Problem. *Zool. Anz.* **150** : 152–170.

—— 1953*a*. Reports of the Lund University Chile Expedition. 1948–1949. 10. Freeliving marine nematodes. I. Enoploidea. *Acta. Univ. lund.* N.F. **49** (6) : 1–155.

—— 1954. Untersuchungen über die algenbewohnende Mikrofauna mariner Hartböden. III. Zur Systematik der freilebenden Nematoden des Mittelmeeres. Mit einer ökologischen Untersuchungen über die Beziehung zwischen Nematoden besiedung und Sedimentreichtum des Habitats. *Hydrobiologia*, **6** : 144–217.

—— 1954*a*. On the morphology of the head in the family Leptosomatidae (marine freeliving nematodes). With a key to all genera described. *Ark. Zool.* **6** : 69–74.

—— 1954*b*. Reports of the Lund University Chile Expedition, 1948–49. 17. Free-living marine nematodes. II. Chromadoroidea. *Acta Univ. lund.* N.S. **50** (16) : 1–148.

—— 1955. A collection of marine nematodes from Japan. *Publ. Seto mar. biol. Lab.* **4** : 159–181.

—— 1956. Reports of the Lund University Chile Expedition, 1948–49. 26. Freeliving marine nematodes. III. Axonolaimoidea and Monhysteroidea. *Acta. Univ. lund.* N.F. **53** (13) : 1–115.

—— 1956*a*. Some free-living marine nematodes. *Galathea Rep.* **2** : 243–253.

—— 1959. Freeliving nematodes and other small invertebrates from Puget Sound beaches. *Univ. Wash. Publ. Biol.* **19** : 1–179.